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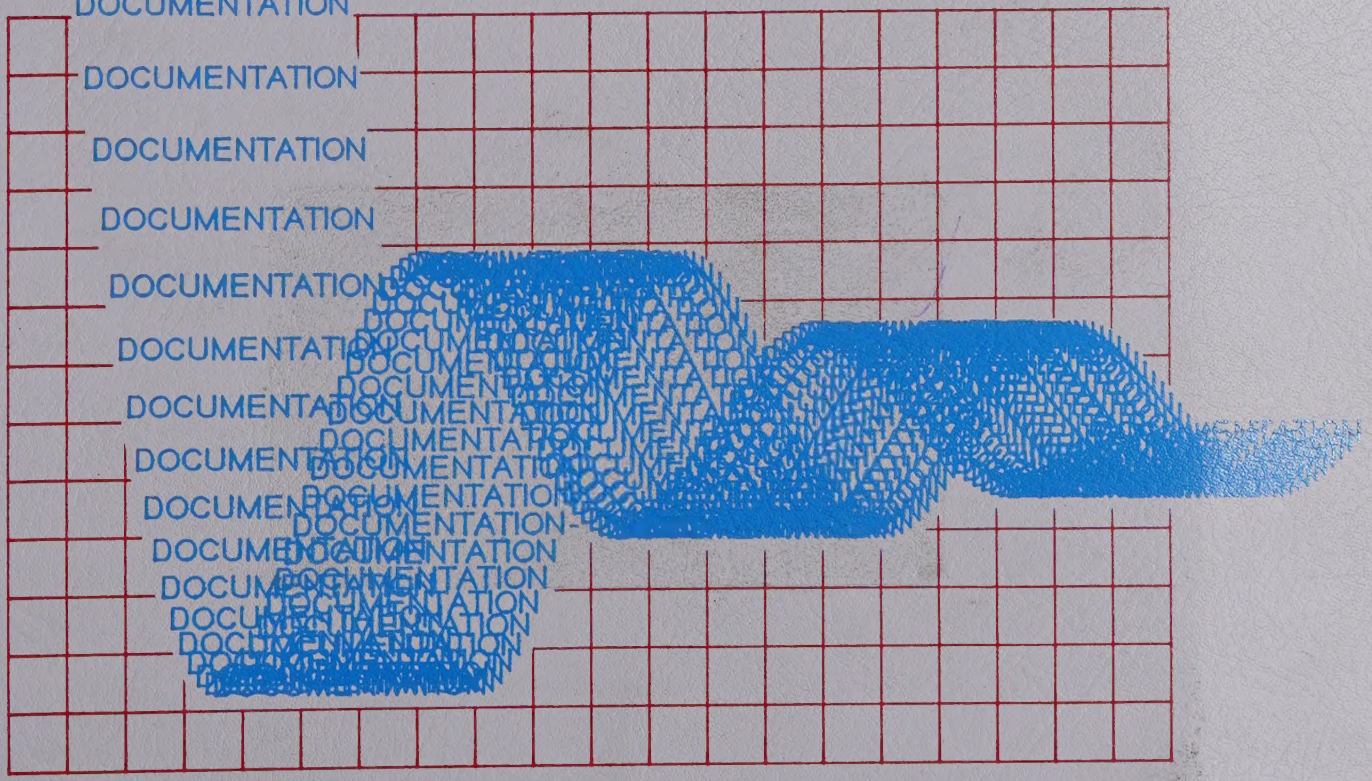

ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

OPTION: SIGNAL VECTOR ANALYSIS FOR SPECTRUM ANALYZER FSE

FSE-B7

1066.4317.02

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Safety Instructions

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

To maintain this condition and to ensure safe operation, the user must observe all instructions and warnings given in this operating manual.

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:

   Pollution severity 2, overvoltage category 2, IP degree of protection 2X, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.

2. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures should be taken to avoid any hazards.

   (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).

3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made (installation and cabling of the unit to be performed only by qualified technical personnel).

4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.

5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.

   If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.

6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.

7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.

   Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.

   If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

   Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.

   Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.

   Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.

   (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

10. Any additional safety instructions given in this manual are also to be observed.

Safety-related symbols used on equipment and documentation from R&S:

Observe operating instructions

Weight indication for units >18 kg

PE terminal

Ground terminal

Danger! Shock hazard

Warning! High temperatures Warning! Hot surfaces

Ground

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ROHDE&SCHWARZ

EC Certificate of Conformity

CE

Certificate No.: 9502052

This is to certify that:

Equipment type	Order No.	Designation
FSE-B1	1073.4990.02	Color Display
FSE-B15	1073.5696.02 /.03	Computer Function
FSE-B16	1073.5973.02 /.03	Ethernet Interface
FSE-B17	1066.4017.02	2nd IEC BUS Interface
FSE-B2	1073.5044.02	7 GHz Frequency Extension
FSE-B4	1073.5396.02	OCXO 10 MHz and Low Phase Noise
FSE-B7	1066.4317.02	Signal-Vectoranalysis

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electromagnetic compatibility
  (89/336/EEC revised by 91/263/EEC, 92/31/EEC)

Conformity is proven by compliance with the following standards:

EN50081-1 : 1992
EN50082-1 : 1992

Affixing the EC conformity mark as from 1995

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Munich,16.10.95

Central Quality Management FS-QZ / Becker

Vector Signal Analyzer FSE-B7 for Spectrum Analyzers FSE

Universal demodulation, analysis and documentation of digital and analog mobile radio signals

For all major mobile radio communication standards:

- GSM/DCS1800/PCS1900
- NADC
- TETRA
- PDC
- PHS
- DECT
- QCDMA (IS95)

For all common digital and analog modulation modes:

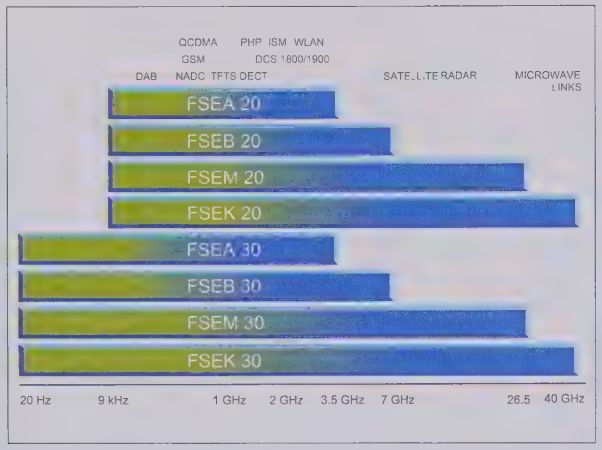
- BPSK
- QPSK, OQPSK
- $\pi/4$ DQPSK
- 8PSK, 8DPSK
- (G)MSK
- (G)FSK
- 4FSK
- 16QAM
- AM/FM/φM

Optimum representation of results:

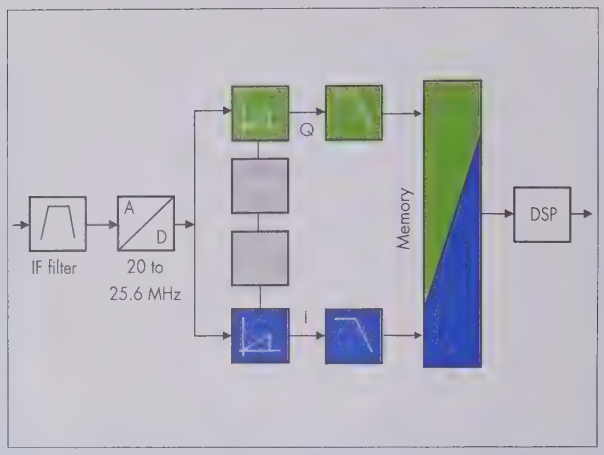
- In-phase and quadrature signals
- Magnitude, phase
- Eye and trellis diagrams
- Vector diagram
- Constellation diagram
- Table with modulation errors
- Demodulated bit stream

ROHDE&SCHWARZ

Characteristics



The vector signal analyzer option can be used with all analyzers of the FSE family to cover the frequency range up to 40 GHz for future-oriented applications



Operating principle of Vector Signal Analyzer Option FSE-B7

Universal analysis of digital mobile radio signals

The vector signal analyzer option upgrades the high-quality Spectrum Analyzers FSE, adding universal demodulation and analysis capability down to bit stream level for digital mobile radio signals. The option supports all common mobile radio communication standards.

Measurement and analysis of analog modulation signals

You want to measure and analyze analog amplitude-, frequency- or phase-modulated signals? This can easily be done even up to 40 GHz with the vector signal analyzer option in Microwave Spectrum Analyzer FSEK.

In addition to standard measurements such as determination of frequency deviation or modulation depth, this option also allows measurements of frequency transients or spurious FM on synthesizers or transmitters.

Since option FSE-B7 can analyze analog and digital modulation signals, it is an ideal tool for use in development and production of dual-mode mobile telephones, for example.

Versatile in the lab

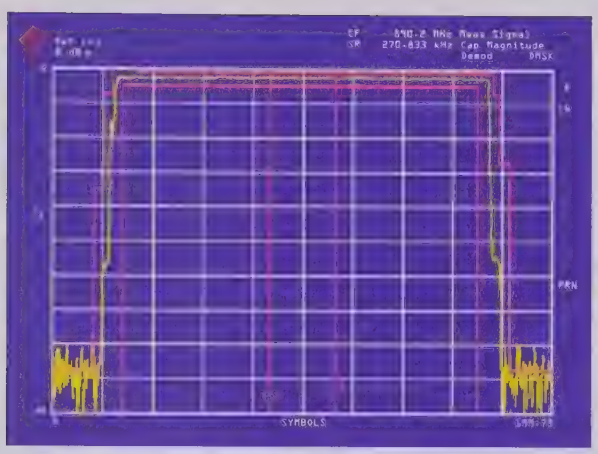
You may want to develop future or company standards, use unconventional formats or modify synchronization sequences. In all these cases, FSE with option FSE-B7 will support you by providing user-selectable bit and symbol rates, filters, modulation modes and synchronization sequences.

Efficient in production

The high measurement speed of 25 sweeps/s in the analyzer mode and typically 3 measurements/s using the vector signal analyzer function is ideal for applications in production. The high flexibility allows multistandard test systems to be configured for easy adaptation to varying production requirements.

Any mobile radio standard at a single keypress

The high flexibility offered by the analyzers is by no means at the price of complicated operations: all major digital modulation standards can be activated at a single keypress. The instrument is then completely configured for measurements in line with the activated



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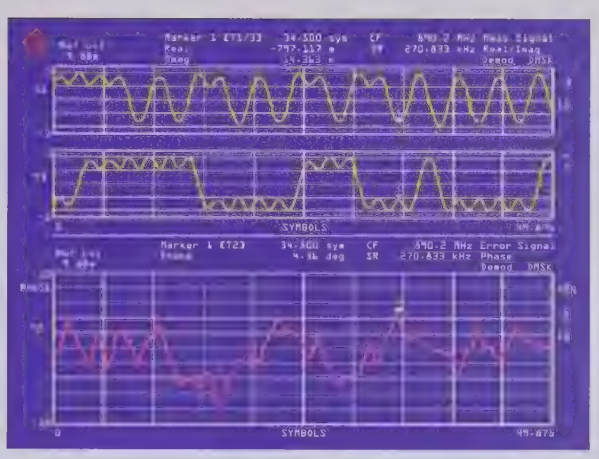
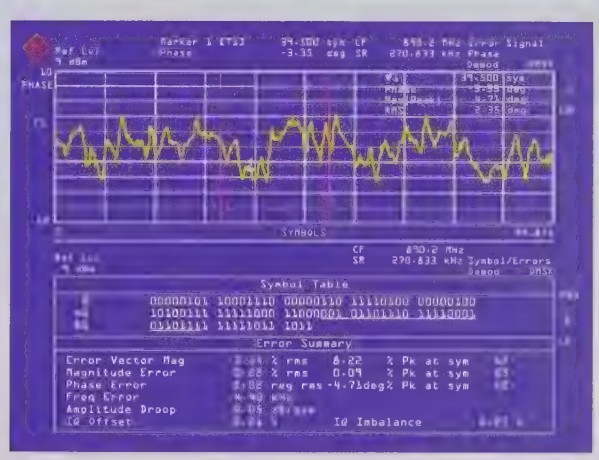


2

1 Measurement of GSM power ramps to standard with high-precision time reference through synchronization to midamble

2 I/Q signal and phase error measurement over 50 symbols of a GSM mobile

3 Phase error, demodulated bits and numeric readout for modulation errors



3

standard. The corresponding synchronization sequences are of course offered along with the standard.

Multiple test functions integrated in one unit

Analyzers FSE in conjunction with option FSE-B7 replace several individual instruments:

- High-grade spectrum analyzer
- Vector demodulator
- Constellation analyzer or
- Process controller

Principle of vector signal analysis

The IF signal is digitized by means of a fast A/D converter, allowing purely digital processing of all subsequent analysis steps, thus making them practically error-free and providing high long-term and temperature stability. After A/D conversion, the signal is digitally mixed into the baseband and split into a real and an imaginary component. The complete signal information is thus available for further analysis. The signal is demodulated down to bit level by several DSPs. From the data stream thus obtained, an ideal signal is calculated. This reference signal is compared with the test signal. The resulting difference signal contains all modulation errors. The sampling rate of the A/D converter is always set to an integer multiple of the symbol rate, which speeds up analysis and contributes to the high rate of 3 measurements/s.

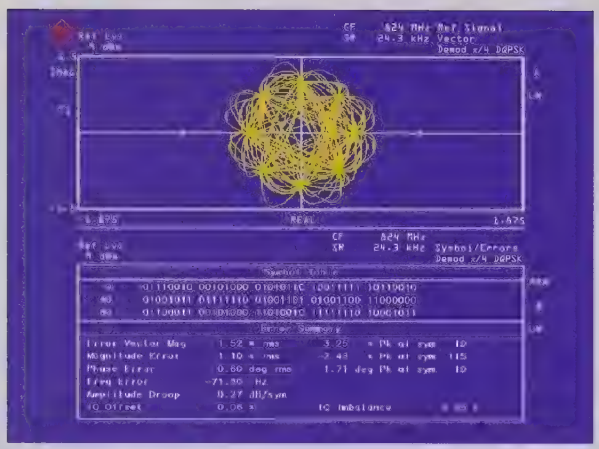
Applications

Power ramp measurements in line with standards (1)

To perform these measurements on TDMA systems such as GSM in line with standards, a time reference must be established from synchronization sequences to pre- or midamble. This is done in the SYNC-SEARCH mode, in which the analyzer triggers on preset or user-defined bit sequences. This not only allows established standards to be measured with high precision, but also modified settings in the case of new developments. Further trigger modes are:

- Video
- External
- Burst search

Applications



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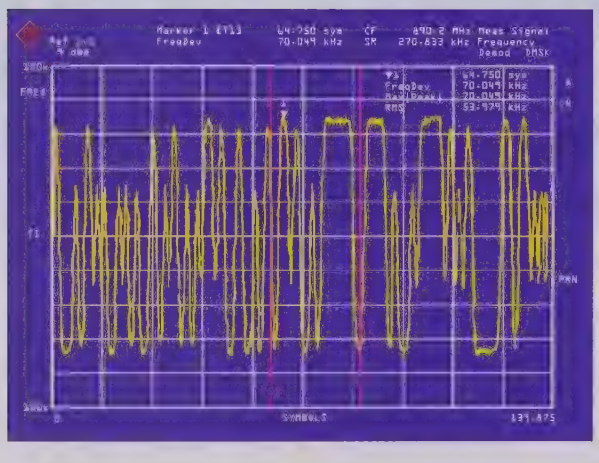


6

4 Measurement of modulation errors of π/4 DQPSK signals (NADC)

5 Constellation diagram of TETRA signal with phase noise. Bottom: complete diagram, top: detail zoomed by factor of 5

6 Frequency response of GSM signal and automatic deviation measurement with modulation marker

Phase error measurements on GSM mobiles or base stations (2 and 3)
The low inherent phase error of <0.5 ° (rms) of option FSE-B7 substantially reduces uncertainty. Tolerances, eg an rms phase error of 5 ° for GSM, can thus be allowed practically completely for the DUT, thus widening the DUT tolerance margin. The SYMBOL TABLE / ERROR SUMMARY lists the demodulated bits and the errors found. The bit sequences and the errors can be read via the fast IEC/IEEE bus of the analyzer. The deviation can be rapidly determined from the frequency display by means of modulation markers.

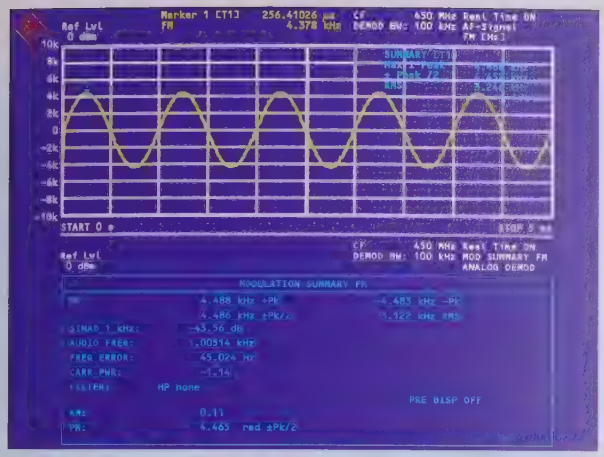
Modulation error measurements on π/4 DQPSK signals (4)
The upper screen (A) shows the vector diagram of an NADC signal, the lower screen gives a summary of relevant errors, measured over a burst signal.

Convenient analysis with constellation diagram (5)
The constellation diagram enables convenient analysis of the degradation of modulation accuracy caused, for example, by nonlinearities, phase noise or amplitude-dependent phase response of amplifiers, converters, etc. The lower screen (B) shows the complete constellation diagram, the upper screen (A) a zoomed detail that allows accurate examination of the error distribution.

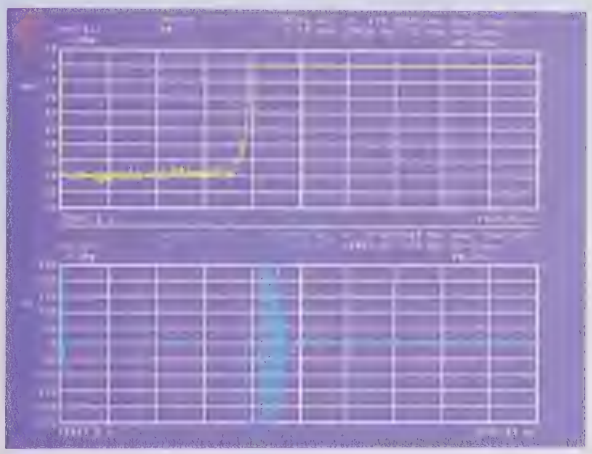
Frequency deviation of GSM signal (6)
The frequency deviation versus time characteristic – shown here as deviation versus symbols – is rms-weighted by means of the modulation marker. It is also possible to measure the rms deviation for any part of the burst, eg for the midamble.

Measurements on frequency-modulated signals (7)
In addition to the frequency deviation measurement on the demodulated signal (screen A) with markers, eg the ±pk/2 marker, MODULATION SUMMARY (screen B) offers a complete overview of the signal parameters:

- Frequency deviation, peak and rms
- Carrier frequency offset from the set receive frequency
- Carrier level
- AM component with FM or



7



9

7 Modulation measurement on frequency-modulated signals with simultaneous analysis of all relevant parameters

8 Measurement of synchronous frequency/phase modulation or AM/φM conversion with simultaneous representation of AM and FM component

9 Measurement of transmitter frequency transients with –30 dB FM squelch

- SINAD value for a modulation frequency of 1 kHz

The following filters can be switched in for weighted measurements:

- Highpass filters 30 Hz, 300 Hz
- Lowpass filters 3 kHz, 15 kHz
- Weighting filters to CCITT and C-message filter

Measurement of AM/φM conversion or synchronous phase modulation (8)

The amplifiers and/or modulators (components) of many transmission systems are operated close to saturation to obtain better efficiency. The resulting AM/φM conversion causes errors in particular with digital phase-modulated systems and crosstalk with analog multicarrier systems.

The low inherent synchronous modulation component and the capability of combining FSE-B7 with microwave analyzers (eg FSEK up to 40 GHz) allows the measurement of AM/φM conversion up to the highest frequencies. FSE simultaneously displays the AM component (screen A) and the resulting FM or φM component (screen B). An AM signal with very low synchronous FM/φM can be generated by I/Q modulation of Tracking Generators FSE-B9/-B11.

Measurement of transmitter frequency transients (9)

The measurement of frequency transients is supported by various functions:

- DC-coupled demodulators enabling the power ramp to be accurately determined with the AM demodulator
- Split screen for simultaneous display of level transients (screen A) and frequency transients (screen B)
- High resolution of eg 100 Hz/div. selectable for the frequency axis
- Settable squelch which in the example shown switches on the FM demodulator at –30 dBm, thus suppressing the noise produced if there is no signal level
- Settable video trigger, trigger delay and pretrigger

Specifications

Specifications are guaranteed subject to the following conditions:

5 minutes warmup at ambient temperature, specified environmental conditions met, calibration cycle adhered to and total calibration performed. Data without tolerances are typical values. Data designated "nominal" apply to design parameters and have not been checked.

Measurement of digital modulation signals

Signal types	continuous signals, TDMA signals
Modulation modes	BPSK, QPSK, Offset QPSK, DQPSK, π/4DQPSK, 8PSK, D8PSK, 16QAM, MSK/GMSK, 2(G)FSK, 4(G)FSK
Standards	GSM/DCS1800/PCS1900, NADC, TETRA, PDC, PHS, CDPD, DECT, PWT/WCPE, CT2, ERMES, FLEX, MODACOM, TFTS, QCDMA (IS95), APCO 25 FM
Filters	
Filter types	raised cosine, square root raised cosine, Gaussian
Setting range α/B x T	0.2 to 3 in steps of 0.01
Filters to specific standards	
FLEX	Bessel B x T = 1.22 and 2.44
ERMES	Bessel B x T = 1.25
QCDMA	forward and reverse channel (IS95)
APCO 25 FM	
Measurements (except FSK)	I and Q signals (filtered, synchronized to frequency and symbol clock) I and Q reference signals (calculated from demodulated bits) I and Q error (magnitude and phase) error vector bit stream/modulation error (symbols demodulated at ideal decision points and table of all modulation errors)
Measurements with FSK	frequency-demodulated signal (filtered, synchronized to symbol clock) FSK reference signal (calculated from demodulated data) FSK error signal data/bit stream/modulation error (symbols demodulated at ideal decision points and table of all modulation error)
Display modes (except FSK)	
Polar diagram	constellation diagram vector diagram
Time domain	in-phase and/or quadrature signal magnitude (level) phase eye diagram trellis diagram
Error display in time domain	error vector magnitude (EVM) in % magnitude error phase/frequency error in-phase and quadrature signals
Numerical error readout (* rms and peak value)	error vector magnitude* magnitude error*, phase error* frequency error I/Q offset I/Q imbalance amplitude droop ρ factor
Display modes with FSK	
Time domain	magnitude (level) frequency deviation eye diagram (frequency signal)
Error display in time domain	frequency deviation error magnitude error
Numerical error readout (* rms and peak value)	deviation error* magnitude error FSK frequency deviation frequency error FSK reference deviation
Modulation measurement range	
Symbol rate	320 Hz to 2 MHz
Testpoints/symbol [1]	
Symbol rate ≤200 kHz	1, 2, 4, 8, 16
200 kHz <symbol rate ≤400 kHz	1, 2, 4, 8
Symbol rate >400 kHz	1, 2, 4
Memory size	
Symbol rate ≤1 MHz	max. 16000 points
Symbol rate >1 MHz	max. 3200 points
Number of demodulated symbols	
Symbol rate ≤1 MHz	max. 1600 symbols (with 4 points/symbol), max. 800 symbols (with 8 points/symbol), max. 400 symbols (with 16 points/symbol)
Symbol rate >1 MHz	max. 600 symbols
Synchronization	
Symbol clock	internal
Frequency/phase	internal
Trigger	free run, external, video
Trigger offset	pre- or posttrigger
Synchronization on bit sequences	definable bit sequences, max. 32 symbols, TDMA bursts
Synchronization offset	selectable, positive or negative

Level measurements

Peak power range	–60 to +30 dBm
Dynamic range for burst measurement	
(mean power, ref. level ≥–10 dBm, peak power = ref. level +1 dB, low-noise mode, points/symbol ≤4)	80 dBc – 4 x log(symbol rate/kHz)
Absolute level error	
Mean power (0 to –10 dB below reference level)	
f ≤1 GHz	1 dB
f >1 GHz	see FSE data sheet (total measurement uncertainty)
Relative level error	
Mean power, level	
0 to –10 dB below reference level	0.2 dB
–10 to –50 dB below reference level	(0.0325/dB – 0.125) dB
Time reference (nominal)	
without clock synchronization	<1/(2 x symbol rate x points/symbol) for MSK/GMSK modulation, <1/(2 x symbol rate) for PSK/QAM/FSK modulation
with clock synchronization	<0.001 x 1/(symbol rate)

[1] 4 points/symbol is the lowest value. With settings of 1 or 2 points/symbol, only 1 or 2 points of the 4 points/symbol are displayed.

Residual error in modulation measurements

(level in range ref. level to ref. level –6 dB; S/N >60 dB, $\alpha/B \times T = 0.3$ to 0.7, number of demodulated symbols >100, averaging ≥10, analog bandwidth >10 x symbol rate)

Input frequency	models 20	≥20 MHz
	models 30	>15 x symbol rate, local suppression calibrated

General modulation modes (except FSK) [2]

	Symbol rate		
	<30 kHz	**30 kHz to <300 kHz**	**300 kHz to <2 MHz**
Error vector magnitude (EVM)	0.5% rms	1% rms	2% rms
Magnitude error	0.5% rms	1% rms	2% rms
Phase error (modulation modes with constant amplitude)	0.3 ° rms	0.5 ° rms	1.5 ° rms
Frequency error	±(symbol rate x 5 x 10^{-6} + 0.1 Hz + reference error x carrier frequency); for reference error, see data sheet Spectrum Analyzers FSE		
I/Q offset error	0.2% (–54 dB)		

Modulation standards

Standard	Error vector magnitude	Phase error	RHO factor
GSM (DCS1800/PCS1900)	–	≤0.5 ° rms, typ. <1.5° peak	–
NADC, CDPD	≤0.5% rms, typ. <1.5% peak	–	–
TETRA, PDC	≤0.7% rms, typ. <2% peak	–	–
PHS	≤0.7% rms, typ. <2% peak	–	–
PWT	≤1% rms, typ. <3% peak	–	–
QCDMA, forward/ reverse channel	–	–	≥0.9995

General FSK modulation modes [2]

(input level ≥–10 dBm, low-noise mode)	Symbol rate	
	<300 kHz	**300 kHz to 2 MHz**
Deviation error [3]	1.5% rms	2% rms
FSK deviation	1.5% of ref. deviation	2% of ref. deviation
Magnitude error	1% rms	2% rms
Frequency offset	0.5% of ref. deviation + error of ref. frequency	0.5% of ref. deviation + error of ref. frequency

Standards

Input level ≥–10 dBm, low-noise mode, all standards, except ERMES; FLEX: 4 points/symbol, ERMES and FLEX: 16 points/symbol

DECT	≤2% rms, typ. <6% peak
MODACOM, CT2	≤1.5% rms, typ. <3% peak
ERMES, FLEX	≤2% rms, typ. <6% peak

Measurement times

Readout of detected symbols and numerical modulation errors, synchronized:

GSM, DCS1800, PCS1900	330 ms
NADC, TETRA, TFTS, PWT/WCPE, PDC, CDPD, DECT, ERMES, FLEX, MODACOM	800 ms

Measurement of analog modulation signals

(Data valid for firmware version 1.62 and higher)

Demodulation bandwidth	
Realtime demodulation	5 to 200 kHz in steps of 1,2,3,5
Offline demodulation	5 kHz to 5 MHz in steps of 1,2,3,5
Demodulation length (max. sweep time)	3500/(demod. bandwidth/Hz) s
Readout	Trace with AF signal, carrier power (AM DC-coupled), or modulation summary (table) with numerical display of: – peak and rms values of modulation depths or deviations of main demodulation – SINAD value 1kHz (only with realtime demodulation) – AF frequency – carrier power – peak values of secondary modulations

The following specifications are valid for demodulation bandwidth ≤2 MHz, IF bandwidth ≥5 x demodulation bandwidth, RF input level ≤–10 dBm, reference level setting = peak input level + 0 to +6 dB.

Amplitude demodulation

Range	up to 100%
AF	
Offline demodulation	0.001 to 0.2 x demod. BW
Realtime demodulation	30 Hz to 0.2 x demod. BW, max. 20 kHz
Error	≤5% of result + residual AM
Distortion (realtime demod.)	
RF freq. <26.5 GHz SINAD 1kHz with m = 80%, LP 3 kHz	>46 dB
Residual AM	
RF freq. <26.5 GHz, demod. BW ≤100 kHz, rms	0.2%
demod. BW >100 kHz, rms	0.2% x √(Demod. BW/100 kHz)
Incidental AM with FM $\Delta f = 0.2$ x demod. BW, f_{mod} = 1 kHz, 10 kHz ≤demod. BW ≤200 kHz, lowpass 5% of demod. BW or 3 kHz, center frequency tuning	≤2% + residual AM

Frequency demodulation

Deviation range	max. 0.4 x demod. BW
AF	
Offline demodulation	DC/0.001 to 0.2 x demod. BW
Realtime demodulation	DC/30 Hz to 0.2 x demod. BW, max. 20 kHz
Error (AF up to 0.1 x demod. BW)	≤5% of result + residual FM
Distortion [4] (realtime demodulation)	
RF ≤1 GHz, demod. BW ≥10 kHz, SINAD 1 kHz with $\Delta f = 0.2$ x demod. BW, LP 3 kHz	>50 dB
Residual FM [5]	
demod. BW ≤200 kHz, lowpass 5% of demod. BW or 3 kHz, rms	≤10 Hz

---

2) Data are valid for FSEA30 or FSEA20 with option FSE-B4 for frequencies <1 GHz in the low-noise mode (ATTEN AUTO LOW NOISE), level ≥–10 dBm.
For frequencies ≥1 GHz the specified values must be multiplied by $10^{0.552 \times \log f[GHz]/1[GHz]}$.
The following applies to FSEB30/FSEM30 or FSEB20/FSEM20 with option FSE-B4:
For frequencies <1 GHz the specified data must be multiplied by 1.4; for frequencies ≥1 GHz the specified data must be multiplied by 1.4 and additionally by $10^{0.354 \times \log f[GHz]/1[GHz]}$;
data for FSEA20, FSEB20, FSEM20 without option FSE-B4 are typically degraded by a factor of 3 as compared to FSEA30, FSEB30, FSEM 30 or FSEA20, FSEB20, FSEM20 with option FSE-B4.

3) $+2 \times 10^{-4} \times f_{symb}$ x (points/symbol) [Hz].

4) Models FSEA20, FSEB20, FSEM20, FSEK20 without option FSE-B4: SINAD specification with FM is valid for deviations ≥10 kHz, with φM at deviation=10 rad due to increased residual FM/φM. The stated values are typical. Incidental FM/φM with AM is not specified due to increased residual FM/φM.

5) Data are valid for FSEA30 or FSEA20 with option FSE-B4 for RF ≤1 GHz. FSEB30, FSEM30, FSEK30 or FSEB20, FSEM20, FSEK20 with option FSE-B4: Residual modulation is higher by a factor of 2. FSEA20 without option FSE-B4: Residual modulation is higher by a factor of 20 (approx.). FSEB20, FSEM20, FSEK20 without option FSE-B4: Residual modulation is higher by a factor of 40 (approx.). RF>1 GHz (all models): Residual modulation is additionally higher by a factor of √f/1 GHz; f=carrier frequency.

Incidental FM with AM [4]
demod. BW ≤200 kHz,
m = 50%, f_{mod} = 1 kHz,
lowpass 5% of demod. BW
or 3 kHz ≤50 Hz + residual FM

Phase demodulation
Range up to 10 rad
AF
Offline demodulation DC/0.001 to 0.1 x demod. BW
<(0.4 x demod. BW)/(phase deviation/rad)
Realtime demodulation 200 Hz to 0.1 x demod. BW, max. 15 kHz
<(0.4 x demod. BW)/(phase deviation/rad), smaller limit values apply

Error ≤5% of result + residual φM
Distortion [4] (real time demod.)
RF≤1 GHz, demod. BW ≥10 kHz,
SINAD 1 kHz with
phase deviation/rad =
0.2 x demod. BW/1 kHz,
HP 300 Hz, LP 3 kHz >50 dB
Residual φM [5]
Demod. BW ≤200 kHz,
Offline demodulation [6]
lowpass 5% of demod. BW, rms ≤0.03 rad
Realtime demodulation
HP 300 Hz, LP 3 kHz, rms ≤0.01 rad
Incidental φM with AM [4]
demod. BW ≤200 kHz,
m = 50%, f_{mod} =1 kHz,
lowpass 5% of demod. BW
or 3 kHz ≤0.05 rad + residual φM

Measurement of unmodulated carrier power
Measurement error
(ref. level to ref. level –30 dB) 1.5 dB

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[6] Contrary to note [5] data are valid for RF ≤100 MHz. For RF >100 MHz residual modulation is higher by a factor of f/100 MHz; f=carrier frequency.

SINAD measurements
Realtime demodulation
AF = 1 kHz ± 4 x 10^{-4} x demod. BW
error with 6 to 54 dB SINAD ±1 dB + error due to demodulator SINAD

Display of AF frequencies
Range
Offline demodulation 0.001 to 0.3 x demod. BW
Realtime demodulation 30 Hz to 0.3 x demod. BW, max. 20 kHz
Resolution 1 mHz to 1 Hz
Error (S/N ≥40 dB) 1 x 10^{-6} x demod. BW + error of reference frequency+1 mHz ±1 digit

AF filters
Realtime demodulation
Lowpass 3 kHz, 15 kHz (Butterworth, 12 dB/oct.)
Highpass 30 Hz, 300 Hz (6 dB/oct.)
Weighting filters CCITT P.53, C message
Offline demodulation
Lowpass 5%, 10%, 25% of demod. BW, (12 dB/oct.)

General data: see data sheet Spectrum Analyzers FSE

Order designations

Spectrum Analyzer 9 kHz to 3.5 GHz	FSEA20	1065.6000.20
Spectrum Analyzer 20 Hz to 3.5 GHz	FSEA30	1065.6000.30
Spectrum Analyzer 9 kHz to 7 GHz	FSEB20	1066.3010.20
Spectrum Analyzer 20 Hz to 7 GHz	FSEB30	1066.3010.30
Spectrum Analyzer 9 kHz to 26.5 GHz	FSEM20	1080.1505.20
Spectrum Analyzer 20 Hz to 26.5 GHz	FSEM30	1079.8500.30
Spectrum Analyzer 9 kHz to 40 GHz	FSEK20	1088.1491.20
Spectrum Analyzer 20 Hz to 40 GHz	FSEK30	1088.3494.30
Vector Signal Analyzer Option for Spectrum Analyzers FSE	FSE-B7	1066.4317.02
Low Phase Noise and OCXO Option (for models 20)	FSE-B4	1073.5396.02

Further options and accessories
See data sheet Spectrum Analyzers FSE, Order No. PD 757.1519

Certified Quality System
ISO 9001

ROHDE&SCHWARZ

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1 Preparation for Use

1.1 Introduction

This manual is an extension to the FSE manual and describes exclusively vector analysis functions. All other functions are described in the FSE manual. For a better orientation refer to the alphabetically arranged table below.

Subject	Section in FSE manual
Basic Steps of Operation	2.3
Emulations	Annex E
Firmware Update	1.8
Gereral Configuration	2.4
Interfaces	Annex A
List of Error Messages	Annex B
Macros	2.8
Measurement Documentation	2.6
Programming Examples	Annex D
Remote Control Command Processing and Status Reporting System	3.7 to 3.8
Remote Control Introduction	3.1 to 3.5
Saving and Recalling Data Sets	2.7
Setup of Display and Limit Lines	2.9.4
Status Display-Remote/Manual Control	2.5

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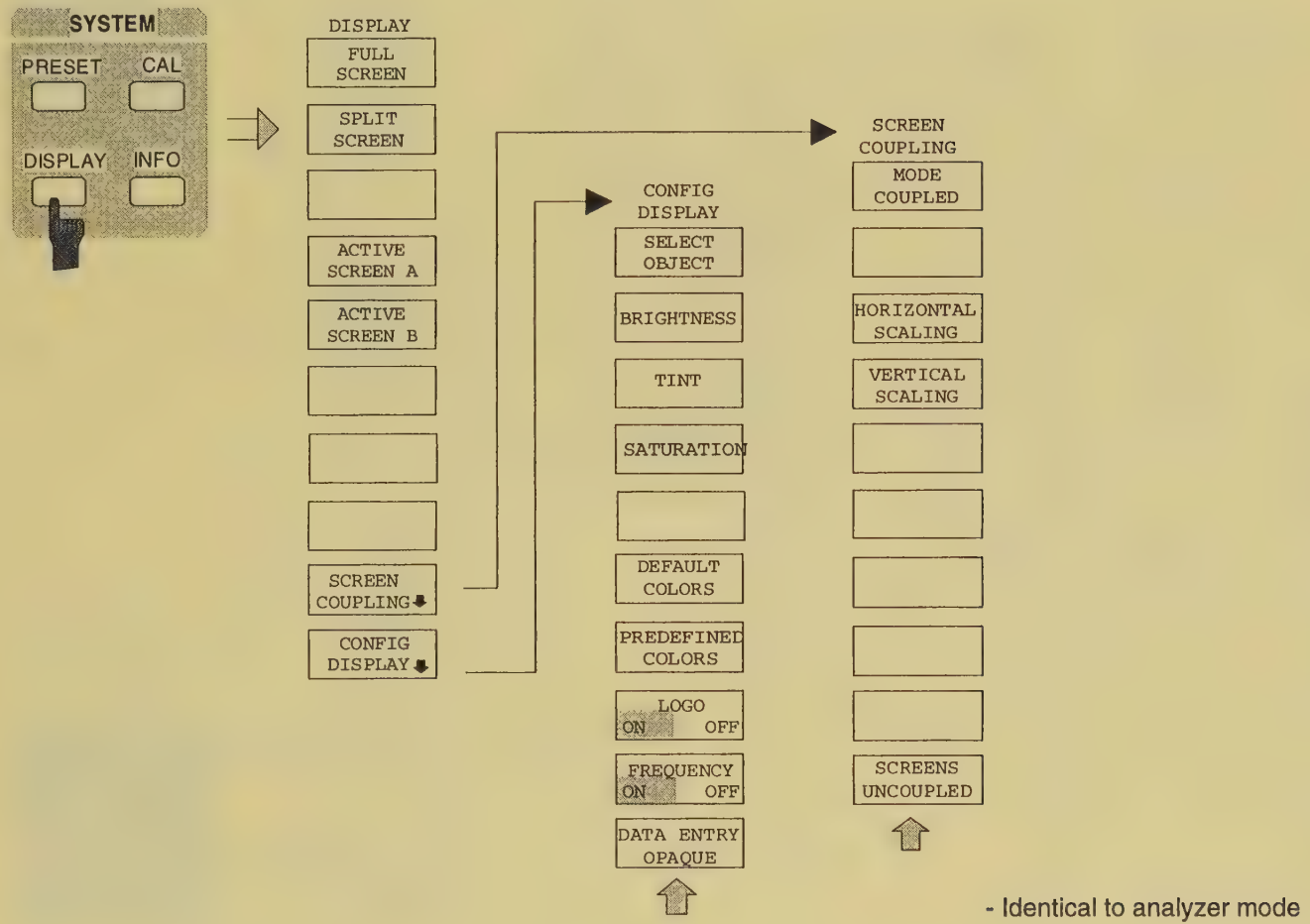
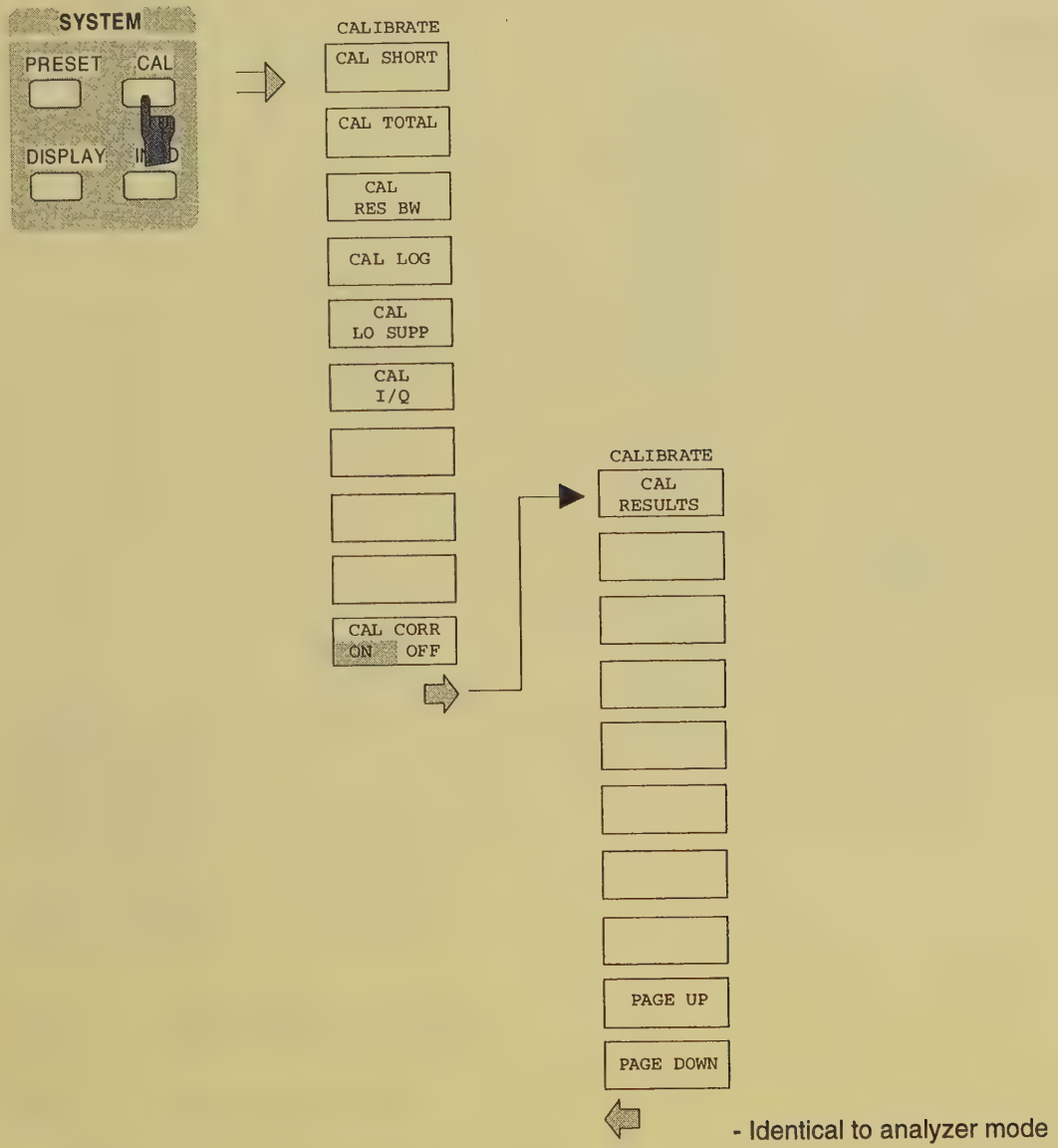
2.2 Menu Overview

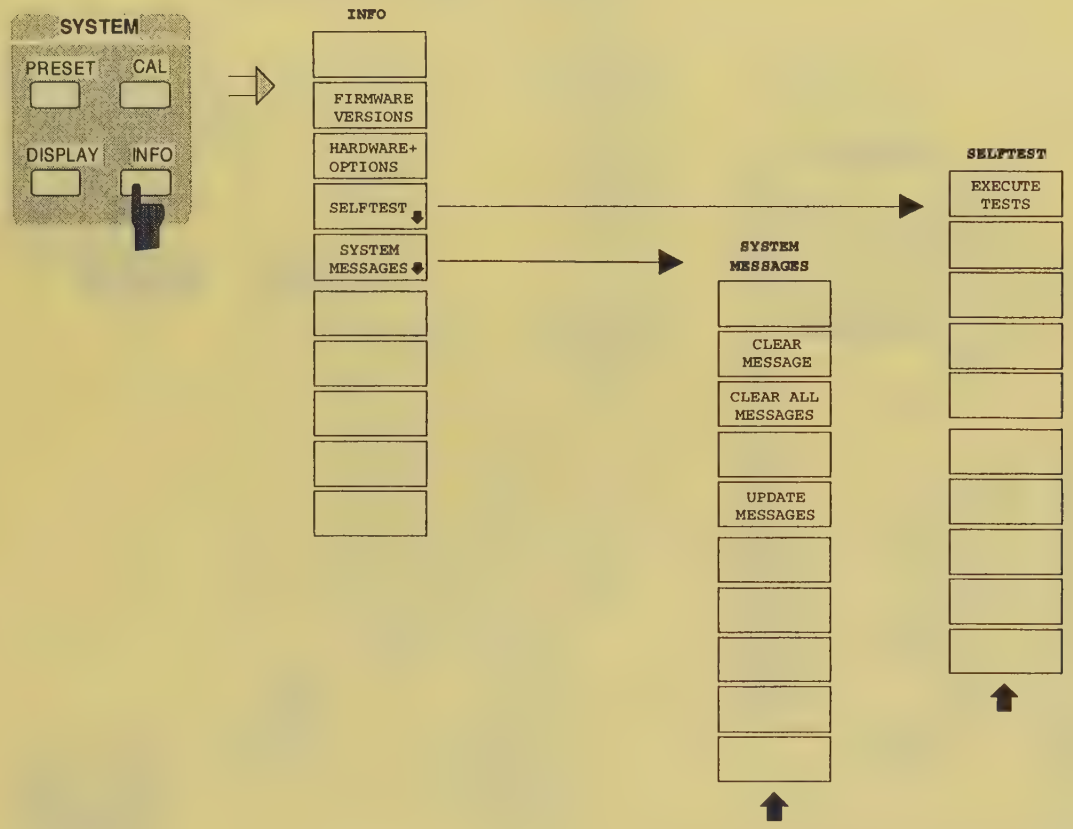
2.2.1 SYSTEM Key Group



- Identical to analyzer mode



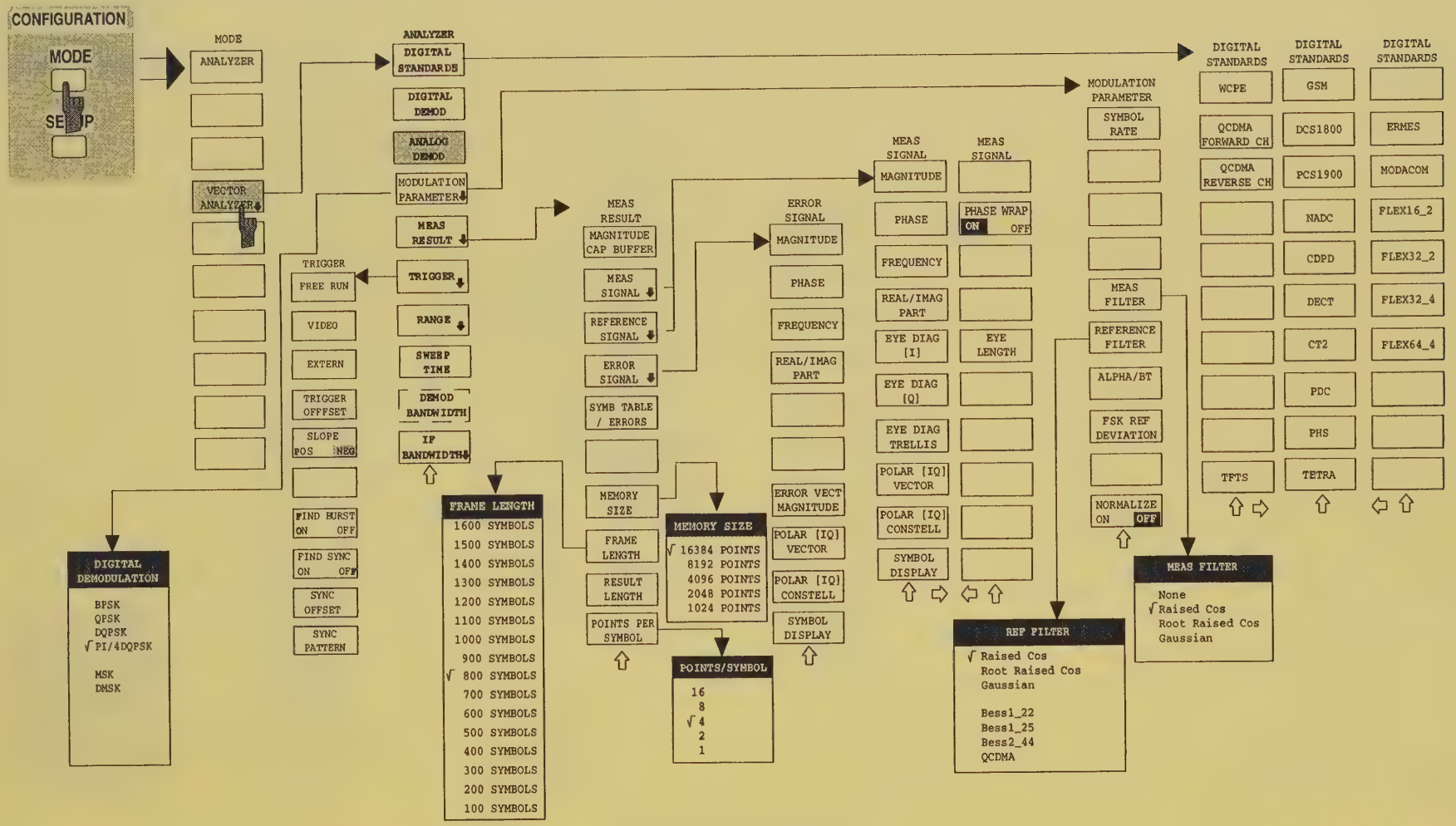
- Identical to analyzer mode



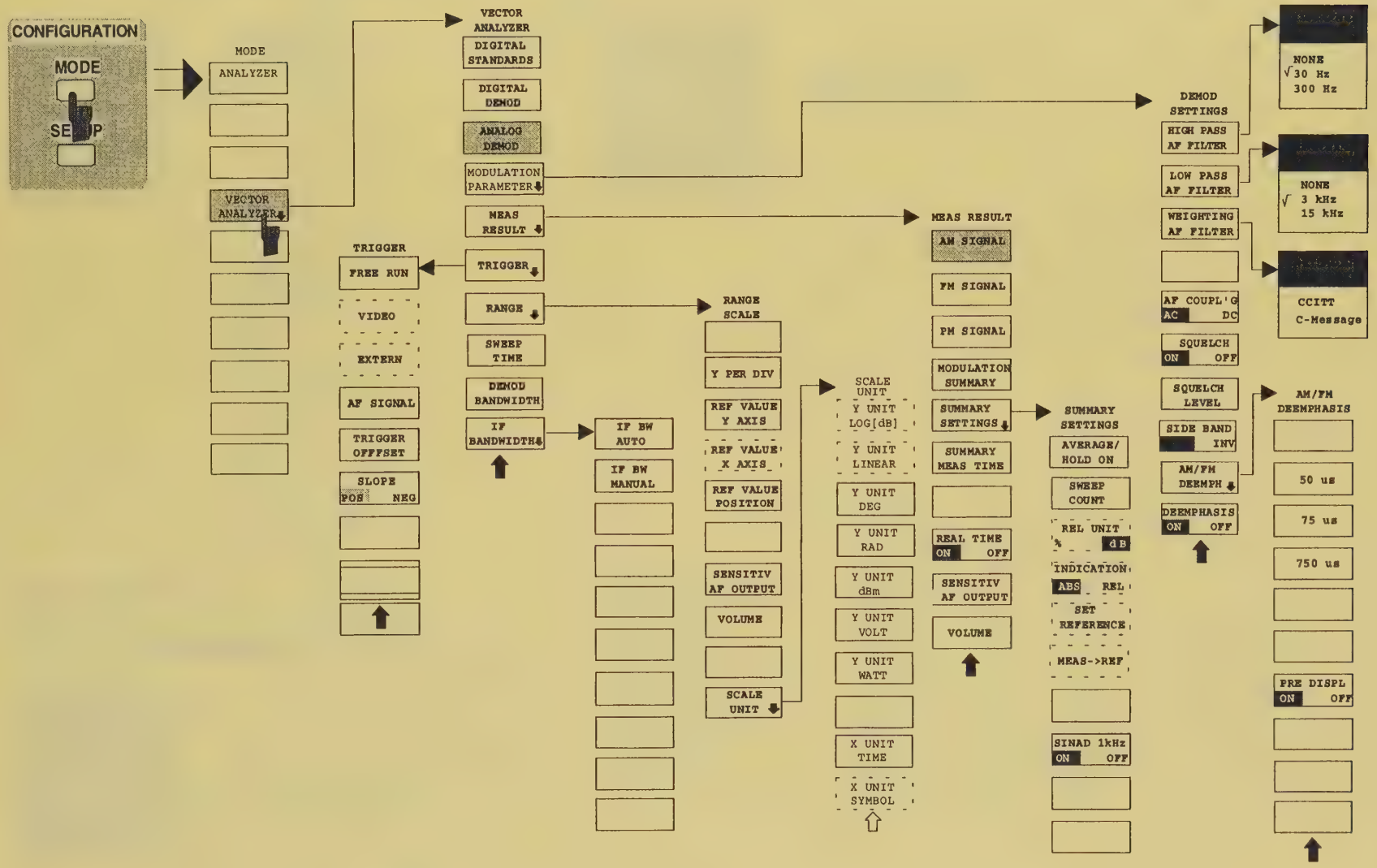
- Identical to analyzer mode

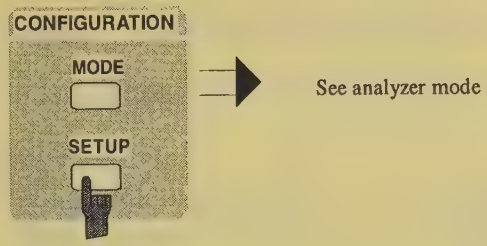
2.2.2 CONFIGURATION Key Group

a) In Digital Demodulation Mode (not FSK-Demodulation)



b) In Analog Demodulation (REAL TIME ON)



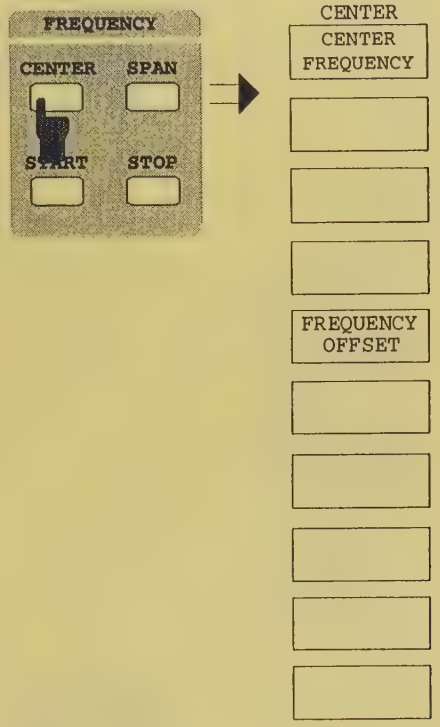


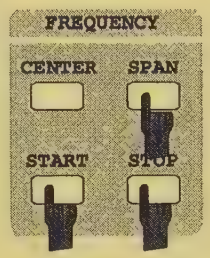
See analyzer mode

2.2.3 HARDCOPY Key Group

See analyzer mode

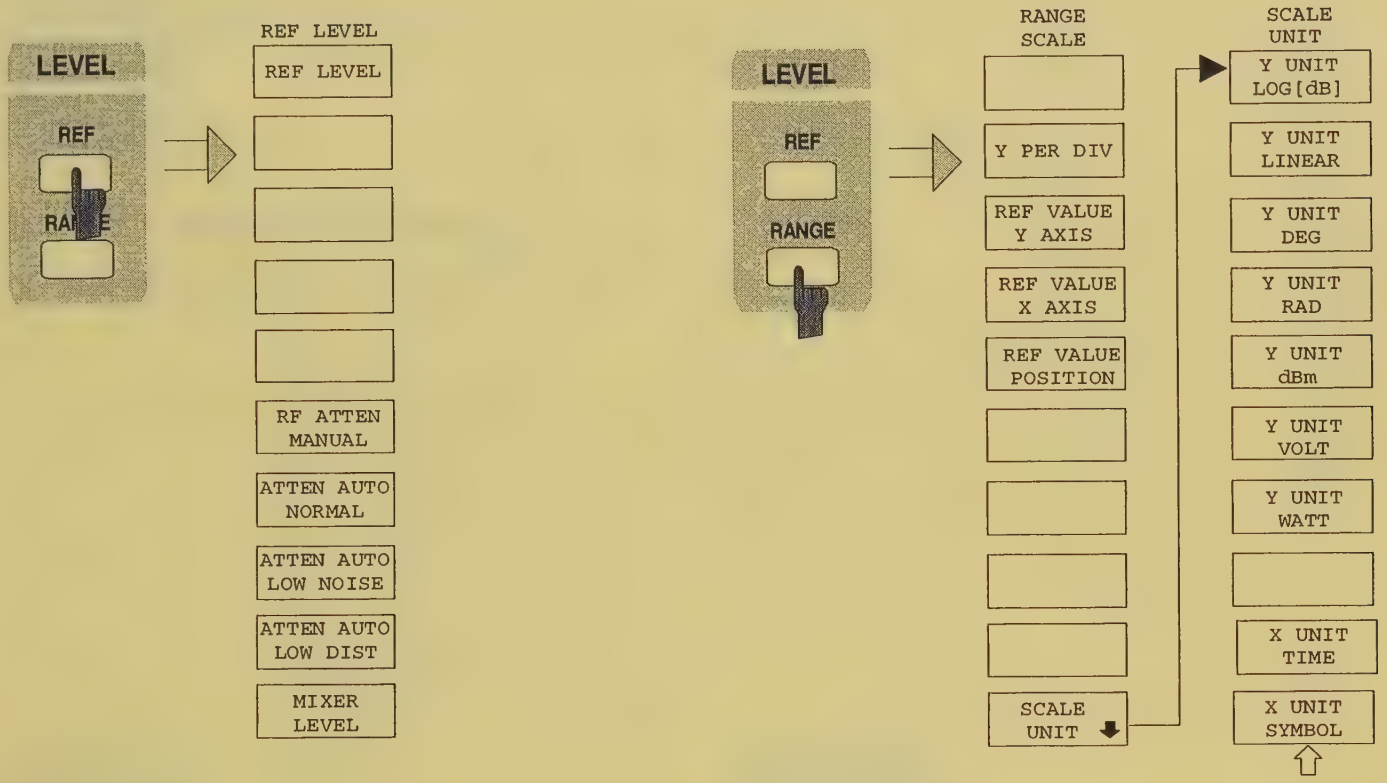
2.2.4 FREQUENCY Key Group

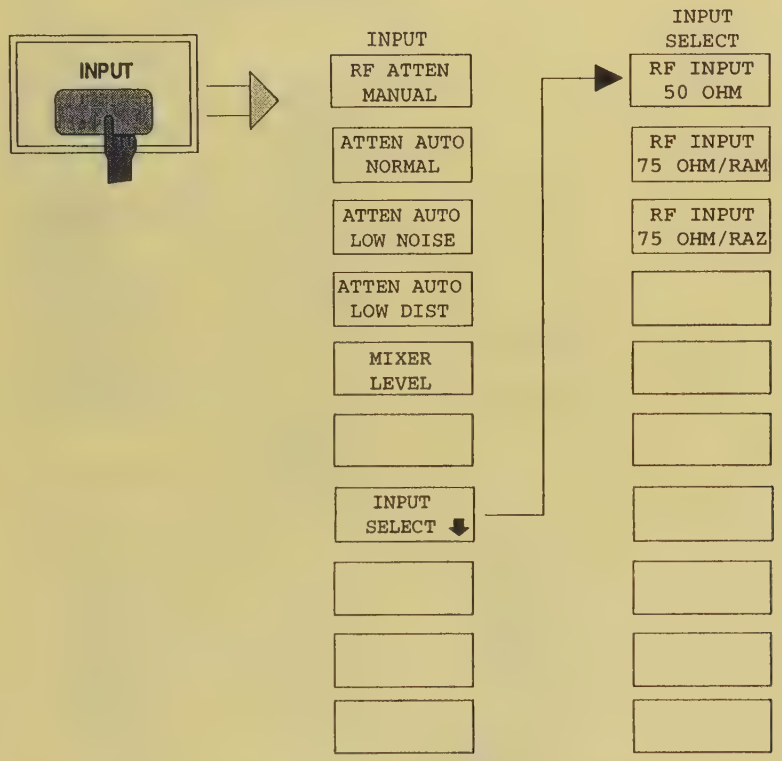




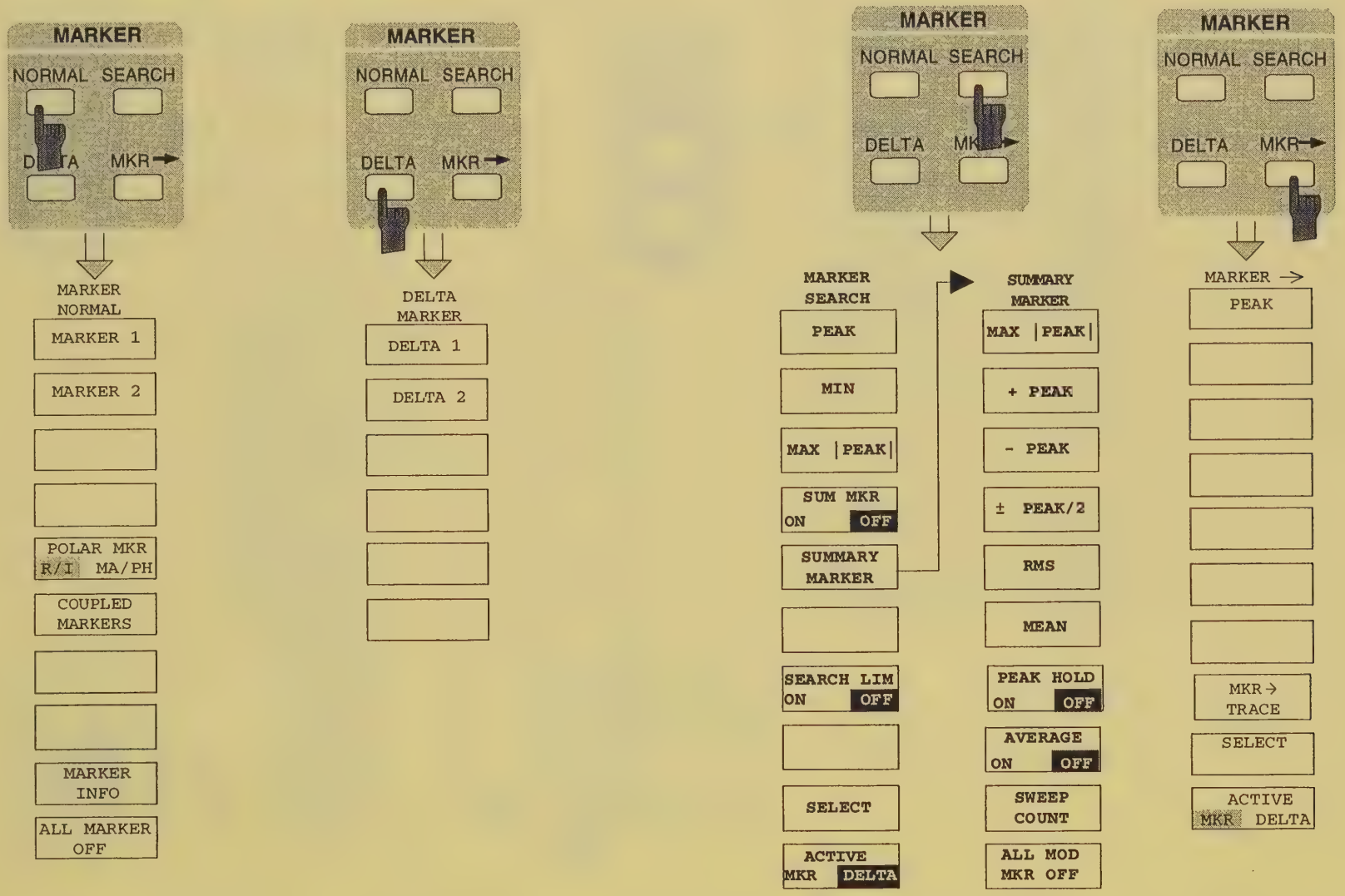
SPAN, START and STOP are without function in the vector analyzer mode!

2.2.5 LEVEL Key Group, INPUT Key

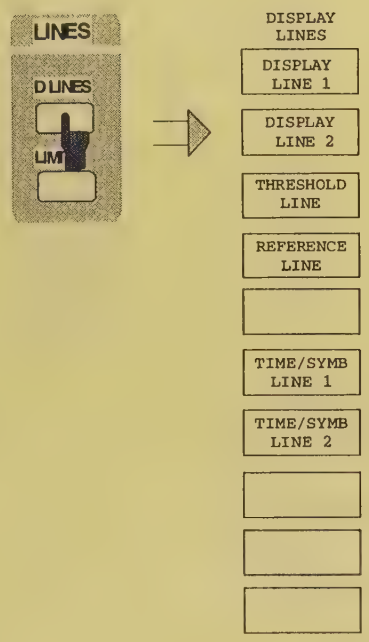


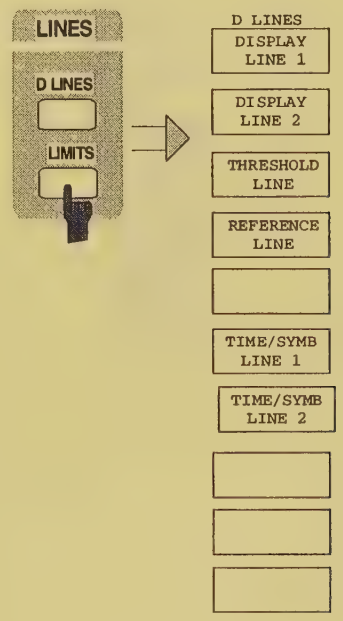

INPUT
INPUT
RF ATTEN MANUAL
ATTEN AUTO NORMAL
ATTEN AUTO LOW NOISE
ATTEN AUTO LOW DIST
MIXER LEVEL
INPUT SELECT
INPUT SELECT
RF INPUT 50 OHM
RF INPUT 75 OHM/RAM
RF INPUT 75 OHM/RAZ

2.2.6 MARKER Key Group

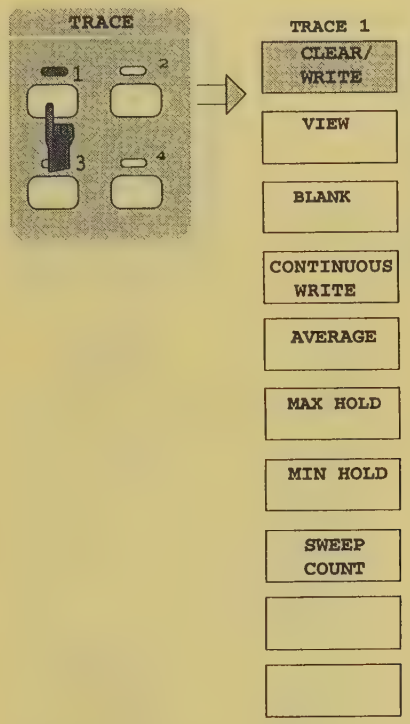


2.2.7 LINES Key Group

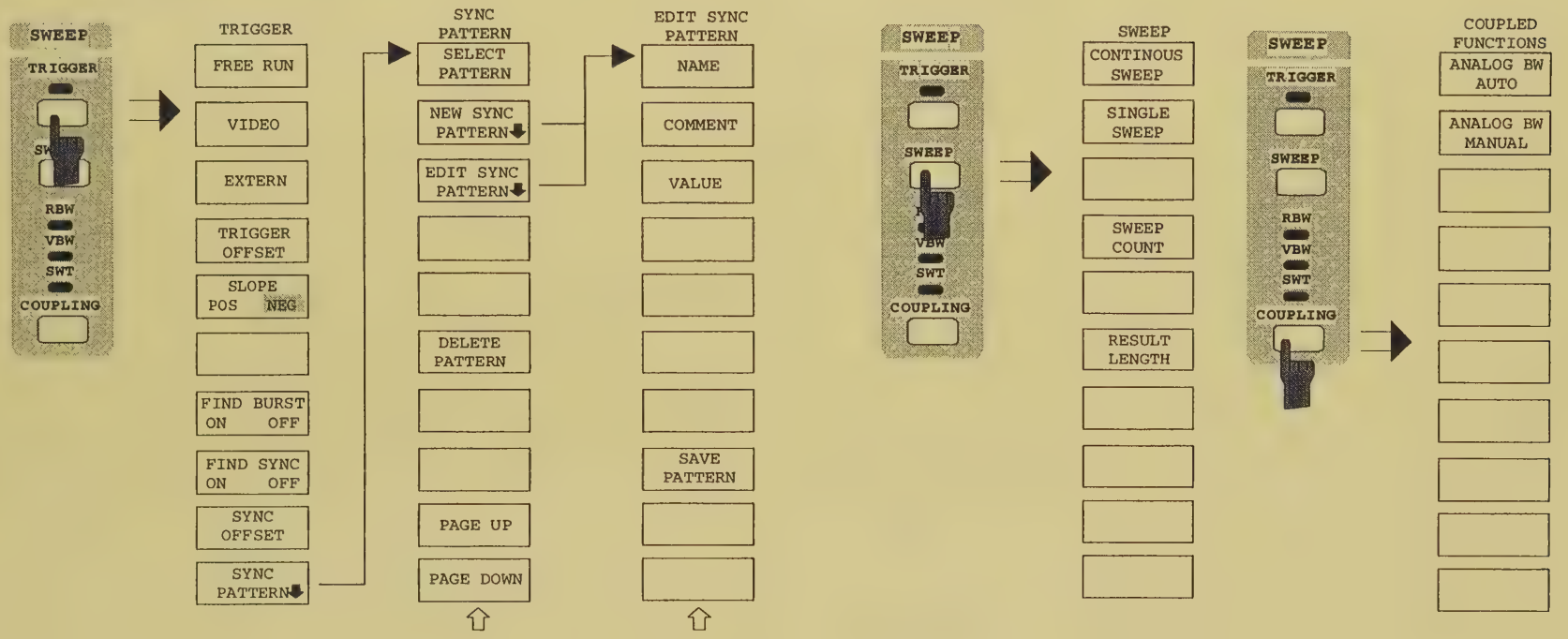




2.2.8 TRACE Key Group



2.2.9 SWEEP Key Group



2.2.10 MEMORY Key Group

See analyzer mode

2.2.11 USER Key Group

See analyzer mode

2.4 Vector Analyzer Mode

The Vector Signal Analyzer in the FSE allows the analysis of analog and digital modulations. For this purpose, the FSE samples the IF signal which is band-limited by the resolution bandwidth (RBW) and mixes it into the complex baseband. The real and imaginary section of the signal is then digitally filtered and further processed in digital signal processors. The complex baseband contains the whole signal information which can be evaluated according to the different criteria.

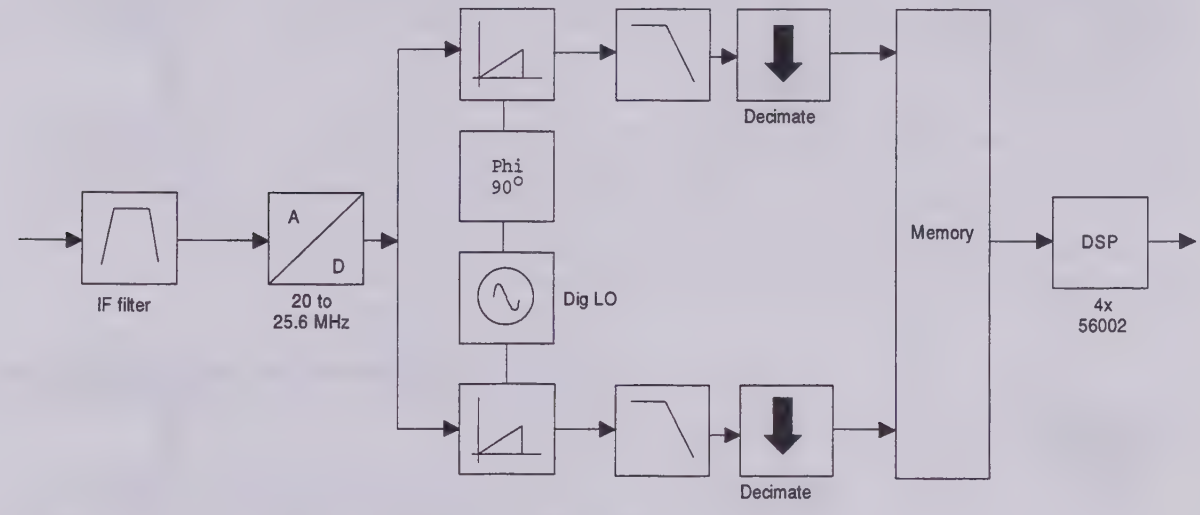


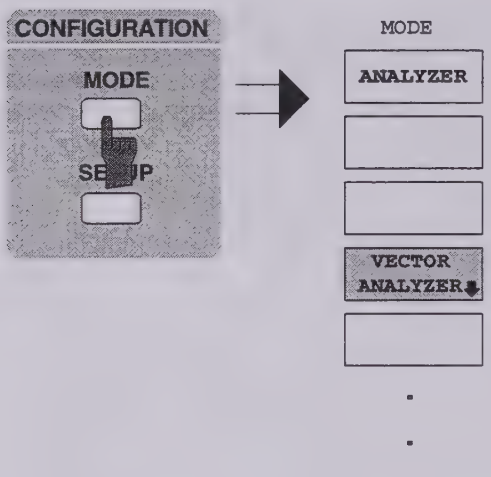
Fig. 2.4-1 Block diagram of FSE vector signal analyzer

Two types of analysis are distinguished in the vector signal analyzer:

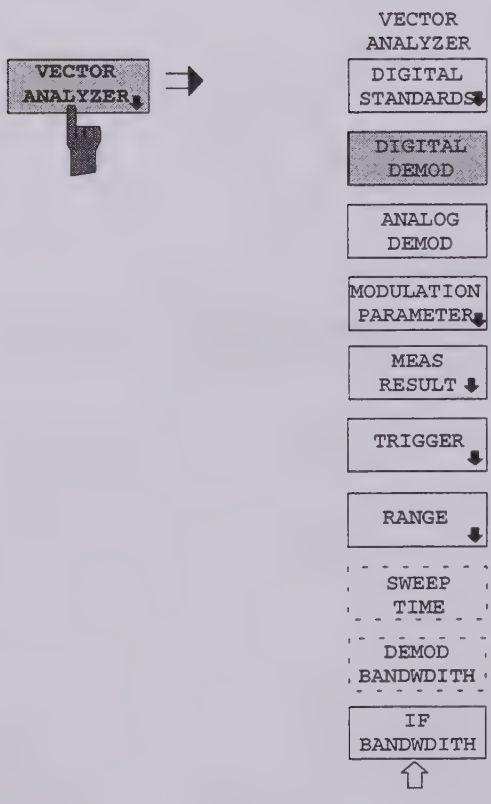
- In the analog demodulation mode, the amplitude (AM), frequency (FM) or phase (PM) demodulated signal is represented as a function of time. Alternatively, display of a table containing the numerical demodulation parameters can be selected *(RESULT DISPLAY)*.
- For digitally modulated signals, the most commonly used demodulators are available to evaluate the modulation parameters.
- In the *DIGITAL DEMODULATION* mode, the magnitude of the non-demodulated signal can also be displayed (MAGNITUDE CAP BUFFER).

2.4.1 Selecting the Operating Mode

The vector analyzer mode is activated in the *CONFIGURATION MODE* menu



The *MODE* key calls up the menu for selecting the operating mode.



The *VECTOR ANALYZER* soft key calls up a submenu. The specific settings for the vector analyzer are entered into this submenu.

The menus for the test parameter settings lying below these keys (*FREQUENCY, LEVEL, MARKER, TRACE, COUPLING, TRIGGER*) are adapted to the specific capabilities of the vector signal analyzer.

The *DIGITAL DEMOD* and *DIGITAL STANDARDS* soft keys are selectors with which the required type of analysis is set.

The *MODULATION PARAMETER* soft key sets the required modulation parameters for the demodulation of digitally modulated signals.

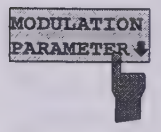
The *MEAS RESULT* soft key calls up a submenu in which the required evaluation of the selected type of analysis is set. For digital demodulation, for example, this is the evaluation of the signal itself or the reference signal, I/Q or vector errors etc.

The *TRIGGER* soft key calls up a menu equal to the *SWEEP TRIGGER* menu.

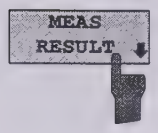
Note: *If two displays (screen A and screen B) are opened after switch-on of the vector signal analysis, the vector analyzer mode is only set for the display activated for entry (marked at the top right corner of diagram). For the other display, the previous settings remain valid. Storage and display of measured values is sequential: first in the upper and then in the lower display.*

The configuration of the vector analysis is performed in four steps:

1. Setting the type of analysis: Analog demodulation of the signal *(ANALOG DEMOD),* general demodulation of digitally modulated signals (*DIGITAL DEMOD)* or setting as required by a specific transmission mode (*DIGITAL STANDARDS,* in this case, step no. 2 can be skipped).
2. Selecting the modulation parameters (*MODULATION PARAMETER*).
3. Selecting the required measurement results (*MEAS RESULT*).
4. Selecting the output format for measurement results (*RESULT DISPLAY*).



The *MODULATION PARAMETER* soft key sets the modulation parameters required for the demodulation of analog or digital signals.



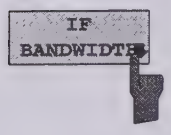
The *MEAS RESULT* soft key calls a submenu where settings concerning the evaluation in the selected type of analysis are performed. For the *DIGITAL DEMODULATION* type of analysis, e.g., the evaluation of measured or reference signal, I/Q or vector error etc. may be set.
For *ANALOG DEMODULATION,* display of the AM-, FM- or PM-demodulated time signal or the table of numeric modulation parameters may be selected, respectively.

See section 2.4.10

See section 2.4.6.2

Operative only if the analog demodulation is active.
The soft key sets the scaling of the time axis for representation of the demodulated signal (see section 2.4.2).

Operative only if the analog demodulation is active.
The soft key sets the (RF-) bandwidth of the demodulators in the ANALOG DEMODULATION mode (see section 2.4.2).



This soft key sets the IF-bandwidth (IF-filter). For analog demodulation, this quantity must be equal to the Demod Bandwidth (see above) or larger.

2.4.2 Analog Demodulation Methods

With amplitude, frequency and phase demodulation, the FSE provides all demodulation methods which can be used for analog RF carrier modulation or which may impair a carrier. The bandwidth used for demodulation depends on the demodulation bandwidth selected. Make sure that the entire modulation spectrum is included in the demodulation bandwidth. Otherwise, signal distortions that impair the modulation will be caused by analog prefiltering with the IF filters of the FSE and digital filtering for suppression of aliasing products due to sampling or data reduction. Correct measurement of the modulation parameters will no longer be possible.

For correct demodulation make sure that only the signal to be analyzed is located within the demoduation bandwidth *(DEMOD BANDWIDTH)* of the FSE. Otherwise, the demodulation would be impaired by adjacent signals. Spectral components of adjacent signals should be at a distance of at least 1.285 times the (demodulation bandwidth)/2 from the center frequency (= carrier frequency).

Depending on the demodulation bandwidth set (*DEMOD BANDWIDTH*), two modes of demodulation are provided:
With *DEMOD BANDWIDTH* ≤ 200 kHz real-time *(REAL TIME ON)* or offline *(REAL TIME OFF)* demodulation can be selected, with *DEMOD BANDWIDTH* > 200 kHz only offline demodulation is possible.
Real-time and offline demodulation differ as follows:

- Real-time demodulation *(REAL TIME ON)*
  - The bandwidth of the demodulated signal can be reduced in the AF region using switchable highpass, lowpass or weighting filters (CCITT or C-message filter) to enable spurious modulation measurements for analog radio systems in line with the standard; moreover, deemphases can also be switched on for FM (and AM). A deemphasis, if switched on, has an effect on the audio signal (provided via loudspeaker or headphones connector) **and** on the result display or on the audio signal only. The switchable filters, however, always have an effect on the display and AF/loudspeaker output.
  - The demodulated signal can be monitored via the built-in loudspeaker or via the headphones output.
  - In addition, the demodulated signal (parts of it) or a summary of numerical modulation parameters can be displayed on the sceen. With the aid of the split screen display, the demodulated signal and the summery of numerical modulation parameters can be displayed at the same time.
- Offline demodulation *(REAL TIME OFF)*
  - The demodulation is not carried out continuously, but in blocks, ie a data block is written into the memory and then demodulated and displayed:
  - The measurement result displayed on the screen is the time function of the demodulated AF signal and/or a summary of numerical modulation parameters.
  - The internal loudspeaker, the headphones output is switched off.
  - No highpass filters and no weighting filters can be activated.
    Deemphases cannot be switched on.
  - To restrict the noise bandwidth, AF lowpass filters can be selected, standardized to the demodulation bandwidth (cutoff frequency = 5, 10 or 25 % of demodulation bandwidth)

The two demodulation modes provided are designed for the following main applications:

- Real-time demodulation (*REAL TIME ON*) for demodulation bandwidths up to max. 200 kHz for modulation measurements to the standard on analog radio systems and also for monitoring
- Offline demodulation (*REAL TIME OFF*), especially for measurement of transients (e.g. frequency settling of oscillators and synthesizers)

The following diagram shows the menus which permit to set the parameters and the result display with analog demodulation.

Menu: CONFIGURATION MODE - VECTORANALYSATOR (with REAL TIME ON)

Menu: CONFIGURATION MODE - VECTORANALYSATOR (with REAL TIME ON)

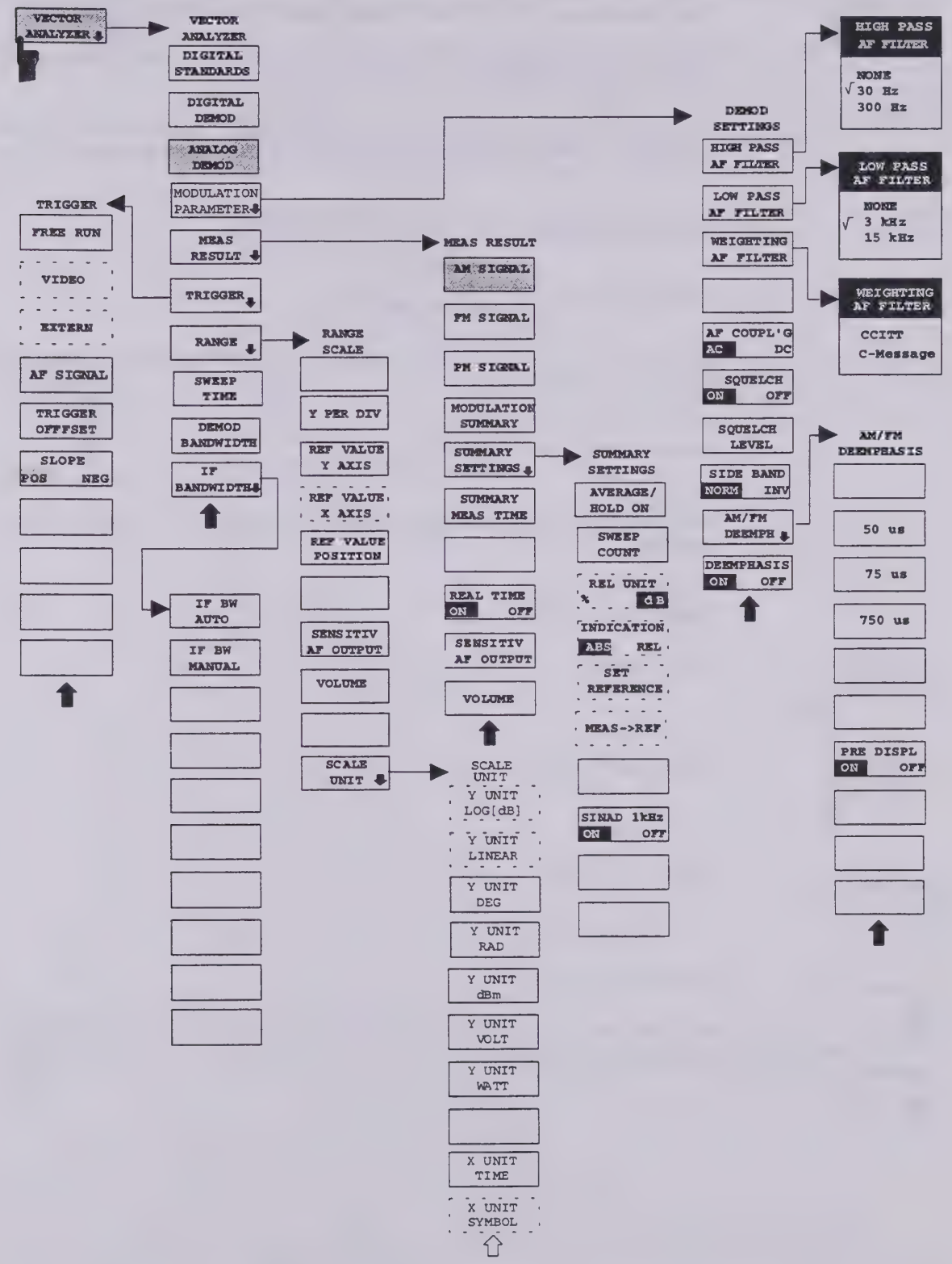


Fig. 2.4-2 Menu structure for setting the demodulation with analog-modulated signals

The *ANALOG DEMOD* softkey activates the analog demodulation mode.

The demodulation (AM, FM and PM demodulation) is performed in parallel.

The type of demodulation or display (AM, FM or PM or numerical display) is set under MEAS RESULT.

The maximum time is determined by the demodulation bandwidth set and the buffer length for the demodulated signal, which is 5000 sampling points for analog demodulation.

The settable maximum time is calculated as follows:

$$\text{SWEEP TIME}_{max} = \frac{5000 * 0.7}{(DEMOD\_BW)} \text{ [s]}$$

A minimum of 10 points can be displayed, so that the following minimum settable time is obtained:

$$\text{SWEEP TIME}_{min} = \frac{10 * 0.7}{(DEMOD\_BW)}$$

Example:
With Demod BW 5 kHz the following maximum and minimum time scale is obtained:

TIME/DIV $_{max}$ = 1.25 s
TIME/DIV $_{min}$ = 2.5 ms

See section 2.4.2.1

See section 2.4.2.2

See section 2.4.2.3

See section 2.4.2.4

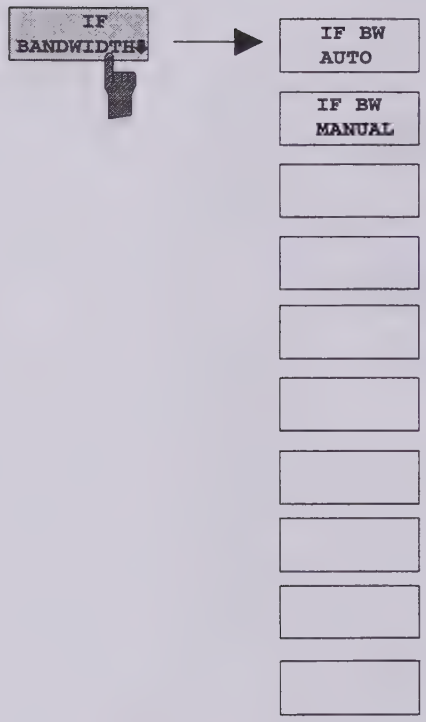
See section 2.4.2.5

The *DEMOD BANDWIDTH* softkey calls up a field for entering the demodulation bandwidth.

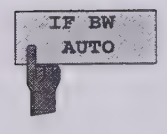
The spectrum to be demodulated should be located completely within this bandwidth, if possible (check in spectrum analyzer mode) in order to avoid demodulation distortions. Spurious signals outside the spectrum to be demodulated do not cause any demodulation errors if the frequency spacing with respect to the tuning frequency is (CENTER FREQUENCY) Delta f ≥ 1.28 x (DEMOD BANDWIDTH)/2.

The DEMOD BANDWIDTH can be set in steps of 1, 2, 3 and 5 in the range from 5 kHz to 5 MHz or, if different entries are made, it will be rounded off to the nearest possible step.

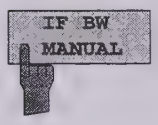
With FM demodulation the maximum deviation that can be measured is restricted to (0.4 x DEMOD BANDWIDTH).



The *IF BANDWIDTH* softkey opens up a submenu where the bandwidth of the analog IF filters is set (corresponds to the resolution bandwidth in spectrum analyzer mode).



The *IF BW AUTO* softkey is used to set the IF bandwidth to the maximum possible value 10 MHz (irrespective of the demodulation bandwidth).



The *IF BW MANUAL* softkey permits to restrict the analog IF bandwidth specifically.

To avoid modulation distortions and errors it is recommended to set the IF bandwidth as large as possible (IF BANDWIDTH ≥ 5 x DEMOD BANDWIDTH).

If spurious signals are to be suppressed outside the useful modulation spectrum, IF BW MANUAL can be used to reduce the IF bandwidth down to a value equal to the demodulation bandwidth.

Possible input values: ≥ DEMOD BANDWIDTH, 5 kHz to 10 MHz.

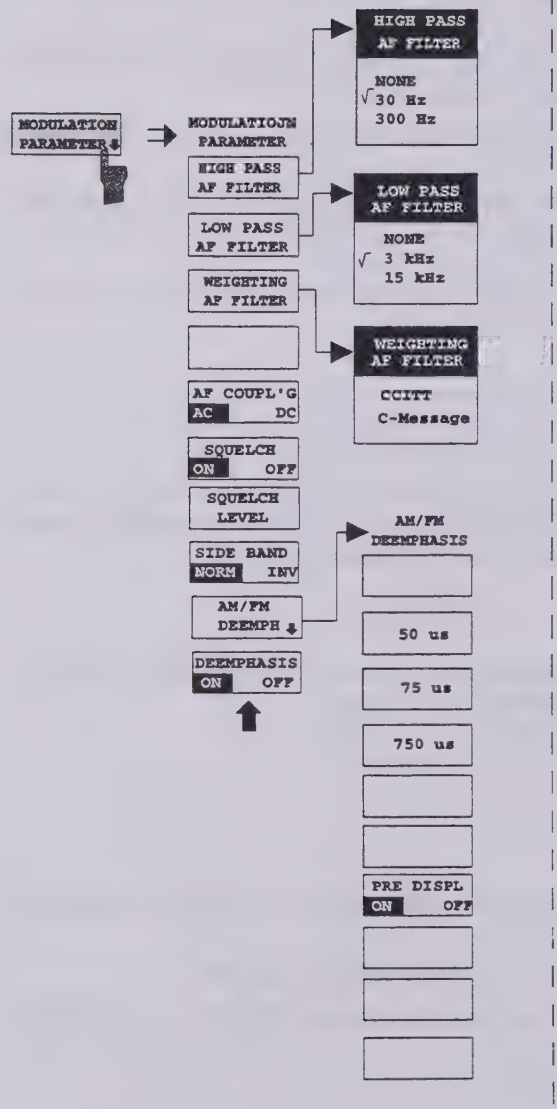
2.4.2.1 Selecting the Modulation Parameters

Submenu: *CONFIGURATION MODE - VECTORANALYZER - ANALOG DEMOD - MODULATION PARAMETER*

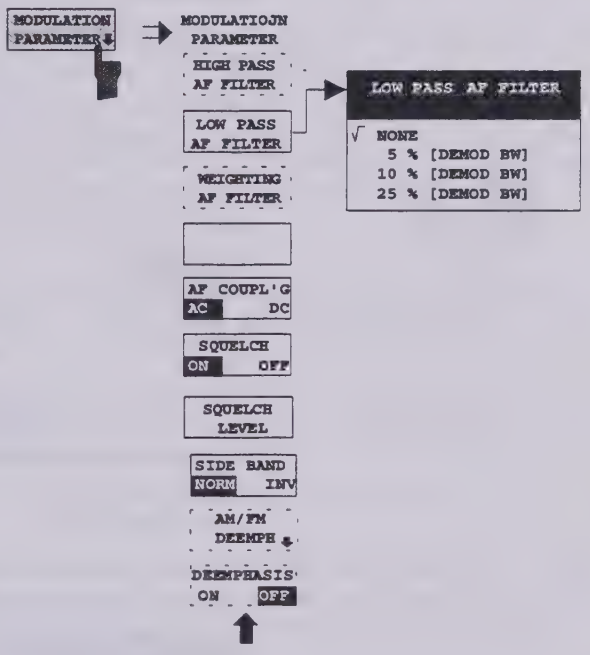
The *MODULATION PARAMETER* softkey calls up a submenu which permits to select the modulation parameters for analog demodulation.

Which menu is displayed depends on whether real-time demodulation is activated ***(REAL TIME ON)*** or not ***(REAL TIME OFF)***.

REAL TIME ON:



REAL TIME OFF:



Note: *The dashed softkeys cannot be activated in the operating mode selected*

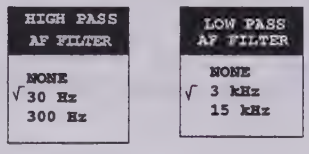
The possible selection of the filter depends on whether real-time demodulation is activated or not (*REAL TIME ON/OFF*).

HIGH PASS AF FILTER

REAL TIME ON:

The softkeys *HIGHPASS AF FILTER* and *LOW PASS AF FILTER* call up input fields which permit to select highpass or lowpass filters for restriction of the AF bandwidth.

LOW PASS AF FILTER



If *REAL TIME ON* is activated, the opposite highpass and lowpass filters as well as standard weighting filters [WEIGHTING AF FILTER] can be selected.

If AF filters are switched on, they act on the display and AF output or loudspeaker output.

The 3-dB cutoff frequencies are indicated for the highpass and lowpass filters.

1st-order highpass filters (6 dB/octave slope) and 2nd-order lowpass filters (12 dB/octave slope) are used.

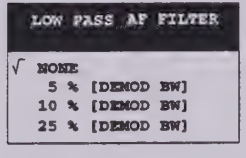
WEIGHTING AF FILTER

The CCITT filter (CCITT P.53) and the C-message filter are used as weighting filters according to US standard.

When one of the two weighting filters is activated, the demodulation bandwidth is automatically switched to 30 kHz. If the demodulation bandwidth is subsequently changed with active weighting filter, the latter is switched off.

REAL TIME OFF:

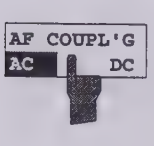
If *REAL TIME OFF* is selected, only lowpass filters can be activated for restriction of the noise bandwidth.



The filter bandwidth (-3 dB) can be selected in % of the demodulation bandwidth.

5, 10 or 25 % of the demodulation bandwidth are possible.

The filters are designed as 2nd-order Butterworth filters (12 dB/octave slope).



The *AF COUPL'G AC/DC* softkey switches the AF analysis stages after the demodulators to DC or AC voltage coupling.

FM:

With FM, AC coupling (*AF COUPL'G AC*) is achieved by determining the center frequency of the signal to be measured and correcting the demodulated signal accordingly.

With *AF COUPL'G DC* the center frequency of the FSE is assumed as the carrier frequency, and no frequency correction is performed. The AF signal is DC-coupled.

PM:

With PM, AC coupling (*AF COUPL'G AC*) is achieved by estimating both the frequency offset and the phase offset and setting them to zero.

Only with ***REAL TIME OFF***:

With *AF COUPL'G DC*, if the center frequency of the signal to be measured deviates, the phase varies with a period corresponding to the difference between applied and set center frequency (0 to 360°).
If the frequency is consistent (e.g. in the case of synchronization to a common reference frequency) the phase is constant on an offset in the range from 0 to 360°. The PM demodulator is DC-coupled.

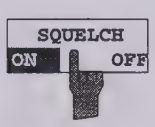
AM:

As a mere envelope demodulator, the AM demodulator is insensitive to frequency errors as long as carrier and sidebands are within the set frequency display range.

In the case of AC coupling (*AF COUPL'G AC*), the demodulated AF signal is standardized to the DC voltage (corresponds to the average carrier value) and the DC component is removed.

The amplitude of the AF signal is directly proportional to the AM modulation depth.

In the case of DC coupling (*AF COUPL'G DC*), the amplitude of the demodulated signal is proportional both to the AM depth and to the level, there is no standardization to the average carrier value. The measured value is displayed in absolute level units.



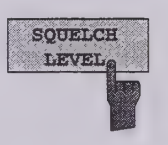
REAL TIME ON:

The *SQUELCH ON* softkey mutes the loudspeaker or headphones output provided that the level falls below a threshold that can be entered under SQUELCH LEVEL. The trace of the demodulated signal is also set to zero at this point in time. The muting circuit responds with a delay that is designed such that a signal modulated with ≥ 30 Hz AM does not cause the circuit to respond in a modulation low status.

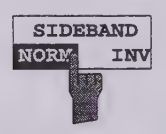
REAL TIME OFF:

With *MEAS RESULT: AM-, FM SIGNAL* or *:PM SIGNAL* the frequency or phase deviation is set to zero when the value falls below the squelch. The muting circuit responds without delay, which is why it is suitable for transient measurements in particular.

Loudspeaker or headphones output are only active if real-time demodulation is selected *(REAL TIME DEMOD ON)*.



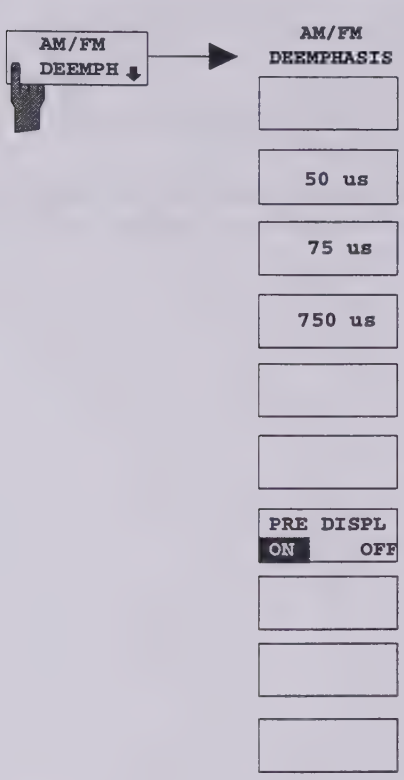
SQUELCH LEVEL permits to enter an absolute level in the unit dBm, below which the SQUELCH function is activated (only with *SQUELCH ON*).



The softkey *SIDEBAND INV (INVERTED)* demodulates and inverts the signal received.

Thus, with FM or PM demodulation, a receive signal with increasing frequency at the FSE input leads to a falling AF signal.

Default status is *SIDEBAND NORM* (NORMAL): A receive signal with increasing frequency at the FSE input leads to an increasing AF signal.



This softkey can only be operated in **REAL TIME ON** mode.

Access to the submenu in which a deemphasis can be selected for FM (or AM) demodulation (An AM deemphasis is prescribed in a few regulations for measurement of synchronous amplitude modulation on FM transmitters.).

Deemphases with the time constants 50 µs, 75 µs (used for radio broadcasting) and 750 µs (used for radio communication) are provided.

The default setting is 50 µs.

If switched on, the deemphasis acts on the audio output.

Via the function *PRE DISP ON* (PRE DISPLAY ON) the effect of the deemphasis can also be extended to the result display to enable spurious modulation measurements complying with the standard.

To be able to measure the correct deviation of the signal applied in spite of the corrected audio signal, the active deemphasis can be switched off via *PRE DISP OFF* for the result display.

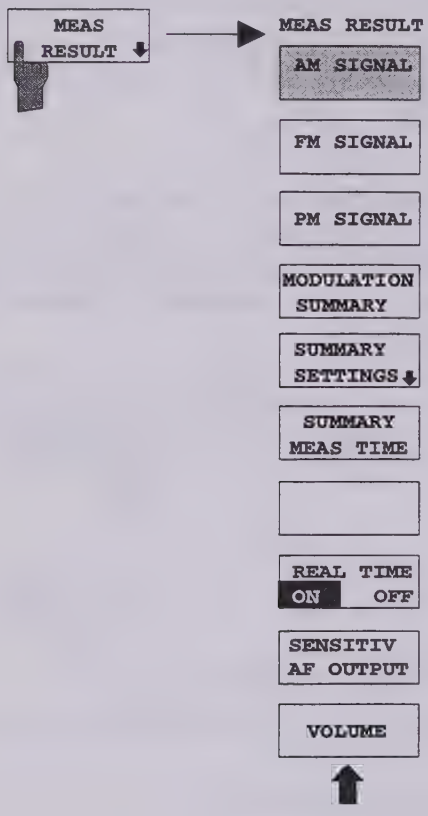
This softkey can only be operated in **REAL TIME ON** mode.

This softkey switches the demphasis selected under *DEEMPHASIS* on or off.

In the default status, the deemphasis is switched off.

2.4.2.2 Selecting the Audio Signal

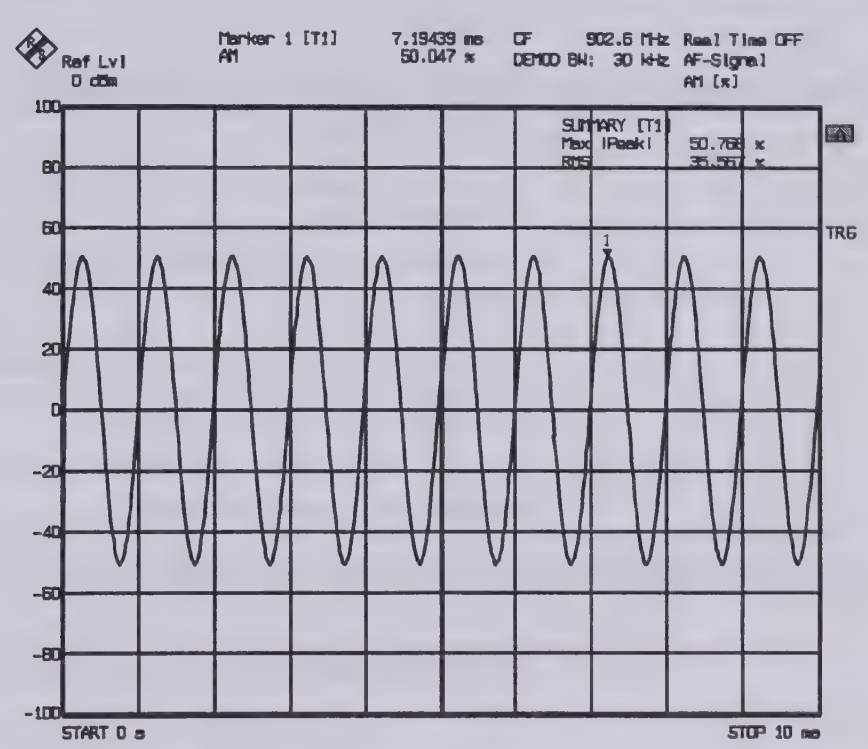
Submenu: *CONFIGURATION: MODE - VECTORANALYZER - ANALOG DEMOD - MEAS RESULT*

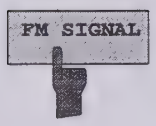


The *MEAS RESULT* softkey opens up a submenu for selection of the AM, FM, or PM demodulated audio signal (display and audio output).

The *AM SIGNAL* softkey is used to display the AM-demodulated time signal provided that MODULATION SUMMARY is not active. If MODULATION SUMMARY is active, the modulation parameters will be numerically displayed with main signal AM (see MODULATON SUMMARY).

The AM-demodulated signal is applied to the audio output (if ***REAL TIME ON***).



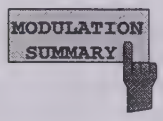


The *FM SIGNAL* softkey displays the FM-demodulated time signal provided that MODULATION SUMMARY is not active. If MODULATION SUMMARY is active, the modulation parameter will be numerically displayed with main signal FM (see MODULATION SUMMARY).

The FM-demodulated signal is present at the audio output (in the case of real-time demodulation).

The *PM SIGNAL* softkey displays the PM-demodulated time signal provided that MODULATION SUMMARY is not active. If MODULATION SUMMARY is active, the modulation parameter will be numerically displayed with main signal PM (see MODULATION SUMMARY).

In the case of ***REAL TIME ON*** the PM-demodulated signal is present at the audio output.



The *MODULATION SUMMARY* softkey (on/off switch) switches from the display of the audio signal versus time to the summary of the numeric modulation parameters.

Of the main signal in question the positive and negative peak modulation value, half the peak value as well as the rms value are displayed with absolute display (see SUMMARY SETTING) (except for AM DC: the +- Pk/2 detector does not display the peak-to-peak value, but the average from positive and negative peak value).

Parallel to the main signal, the parameters of the remaining demodulators are also displayed, ie the absolute, arithmetic average from positive and negative peak value.

The following parameters of the demodulation main signal can be displayed in addition:

- SINAD value (1-kHz modulation frequency fixed)
- Audio frequency

In addition, the frequency error as well as the carrier power (to be more exact: power of the unmodulated carrier) and the configuration of the active AF filter and deemphasis are displayed.

Example: AM signal/REAL TIME ON:

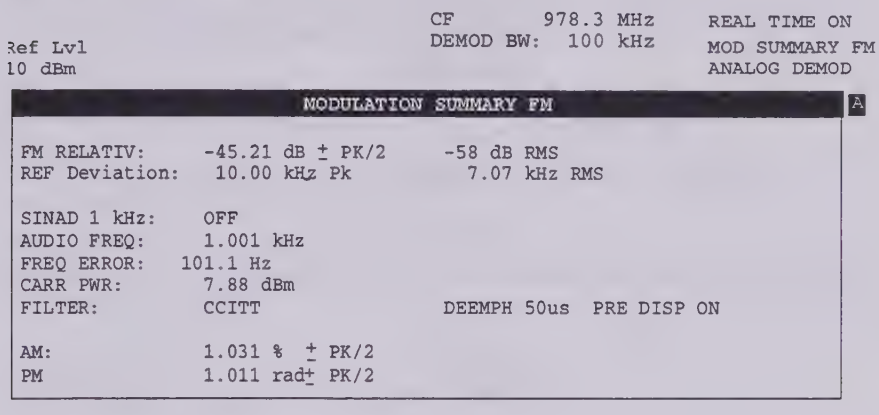
```
                                    CF        978.3 MHz     REAL TIME ON
                                    DEMOD BW:   100 kHz     MOD SUMMARY AM
Ref Lvl                                                     ANALOG DEMOD
 10 dBm
                    MODULATION SUMMARY AM                                A

AM:              54.20 % +Pk       54.68 -Pk
                 54.44 %± PK/2     33.3 % RMS

SINAD 1 kHz:     35.1 dB
AUDIO FREQ:       1.001 kHz
FREQ ERROR:     101.1 Hz
CARR PWR:         7.88 dBm
FILTER:         HP 30 Hz     LP 3 kHz        DEEMPH OFF

FM:               1.031 kHz± PK/2
PM                1.011 rad± PK/2
```

Example: AM signal/REAL TIME OFF:

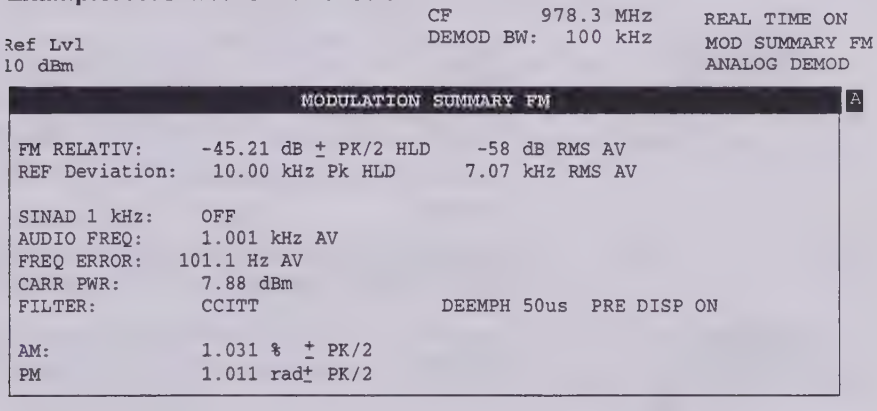
```
                                    CF        978.3 MHz     REAL TIME OFF
                                    DEMOD BW:   100 kHz     MOD SUMMARY AM
Ref Lvl                                                     ANALOG DEMOD
10 dBm
                    MODULATION SUMMARY AM                                A

AM:              54.20 % +Pk       54.68 -Pk
                 54.44 % ±PK/2     33.3 % RMS

SINAD 1 kHz:     --
AUDIO FREQ:       1.001 kHz
FREQ ERROR:     101.1 Hz
CARR PWR:         7.88 dBm
FILTER:         HP --        LP 10 % [DEMOD BW]            DEEMPH OFF

FM:               1.031 kHz ±PK/2
PM                1.011 rad ±PK/2
```

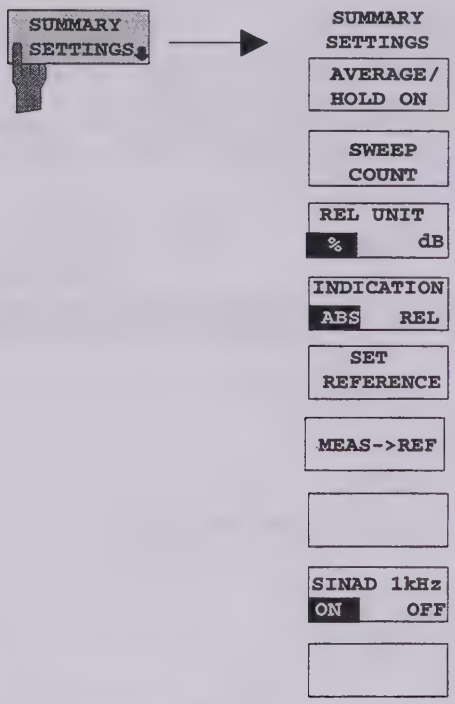
Example: FM signal, relative measurement:

In the case of relative measurement, the absolute arithmetic average from positive and negative peak value as well as the rms value of the main signal are also displayed. The separate display of positive and negative peak value is omitted. Instead, the reference value is additionally displayed as peak and rms value.


Ref Lvl
10 dBm
CF 978.3 MHz
DEMOD BW: 100 kHz
REAL TIME ON
MOD SUMMARY FM
ANALOG DEMOD
MODULATION SUMMARY FM
A
FM RELATIV: -45.21 dB ± PK/2 -58 dB RMS
REF Deviation: 10.00 kHz Pk 7.07 kHz RMS
SINAD 1 kHz: OFF
AUDIO FREQ: 1.001 kHz
FREQ ERROR: 101.1 Hz
CARR PWR: 7.88 dBm
FILTER: CCITT DEEMPH 50us PRE DISP ON
AM: 1.031 % ± PK/2
PM 1.011 rad± PK/2

Example: AVERAGE/ HOLD ON:


Ref Lvl
10 dBm
CF 978.3 MHz
DEMOD BW: 100 kHz
REAL TIME ON
MOD SUMMARY FM
ANALOG DEMOD
MODULATION SUMMARY FM
A
FM RELATIV: -45.21 dB ± PK/2 HLD -58 dB RMS AV
REF Deviation: 10.00 kHz Pk HLD 7.07 kHz RMS AV
SINAD 1 kHz: OFF
AUDIO FREQ: 1.001 kHz AV
FREQ ERROR: 101.1 Hz AV
CARR PWR: 7.88 dBm
FILTER: CCITT DEEMPH 50us PRE DISP ON
AM: 1.031 % ± PK/2
PM 1.011 rad± PK/2



The *SUMMARY SETTINGS* softkey opens up the submenu for configuration of the summary of all numeric measured values.

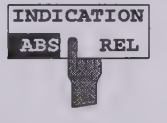
The *AVERAGE/HOLD ON* softkey permits to average all display values obtained in the number of sweeps defined under Sweep Count except for the Pk values with Single Sweep (the display *No of Measurements* appears in the modulation summary, *AV* is indicated after the units).

The Pk values are displayed in the Pk Hold mode (display *Hold* after the Pk units).

In the case of a restart, the Pk values and AV values are reset by means of Single Sweep or by switching *TRACE AVERAGE/HOLD ON* off and on.

The *SWEEP COUNT* softkey sets the number of sweeps used to determine the average or PK Hold values (see also 2.4.2.5)

With relative display (*INDICATION REL*) it is possible to choose between the units % and dB.



The *INDICATION ABS REL* softkey switches between absolute (*ABS*, default setting) and relative display (*REL*). The reference value for the relative display can be entered by means of *SET REFERENCE* or *MEAS→ REF*.

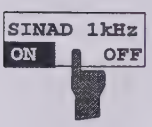
Only the main signal can be displayed in relative mode, the other signals are indicated in absolute display in any case.

For relative indication, the default unit is dB and can be changed from dB to % via the softkey *REL UNIT%*.

The *SET REFERENCE* softkey opens up a field for input of a reference modulation (for main signal).

The peak value of the modulation is to be entered. The rms reference value will then be peak value/√2.

The *MEAS→REF* softkey is used to represent the current absolute measured values of the main modulation signal (+-PK/2 and RMS) as reference values for the relative display.



This softkey can only be operated in **REAL TIME ON** mode.

The *SINAD 1 kHz ON* softkey activates the SINAD measurement for the main modulation signal.

Irrespective of the signal applied, the main modulation signal is compared with the main modulation signal which is filtered by a 1-kHz notch filter. The display unit is dB.

When a signal modulated with 1 kHz is applied, the SINAD value is thus displayed correctly.
Default setting is *SINAD 1 kHz OFF*.

With ***REAL TIME OFF*** (no real-time demodulation) no SINAD measurement is possible, the softkey cannot be operated.

This softkey can only be operated in **REAL TIME ON** mode.

The *SUMMARY MEAS TIME* softkey opens up a field for entering the measuring time (as well as the measured value update rate) for the numerical measured values of the modulation summary.

Default setting is 100 ms

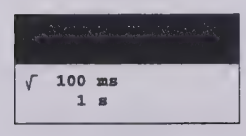
Thus, with a stationary modulation frequency of 30 (typ. 20) Hz, peak values and rms value can be determined correctly.

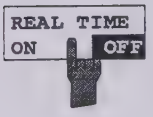
The measured values are updated at least every 100 ms, ie max. 10x/s.

With a measuring time of 1 s and a stationary modulation frequency of up to 5 Hz peak values and rms values can be determined correctly.

The measured values are updated every second, ie max. 1x/s.

In both cases, the peak values are measured continuously, the time constant of the rms detector is adapted accordingly.

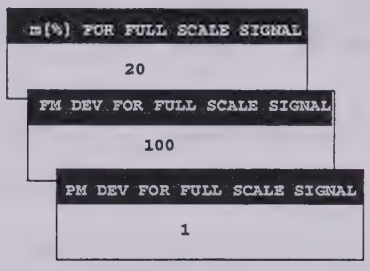




For demodulation bandwidths (DEMOD BANDWIDTH) ≤ 200 kHz, real-time demodulation can be switched on or off.
(Off is default status).

Demodulation bandwidths > 200 kHz do not allow real-time modulation.

The *SENSITIV AF OUTPUT* (SENSITIVITY AF OUTPUT) softkey sets the scaling of the AF output for real-time modulation. Depending on MEAS RESULT (AM, FM or PM signal), an input field appears, where the modulation amplitude is to be entered so that the dynamic range of the AF output is fully utilized.
(Peak voltage 1V):



SENSITIV AF OUTPUT also has an effect on the volume of the loudspeaker and on the headphones output.

Only with real-time demodulation *(REAL TIME ON)*:

With real-time demodulation, the *VOLUME* softkey sets the volume of the demodulated signal (loudspeaker and headphones output) according to the slope of the AF output.

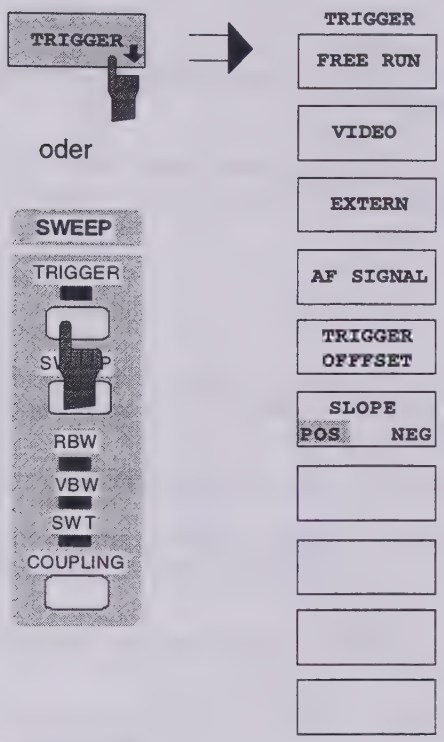
With ***REAL TIME OFF*** (no real-time demodulation) the outputs are switched off.

Note: *If the modulation depth / deviation is very small, the scaling of the AF output (softkey* SENSITIV AF OUTPUT*) is to be matched to achieve a usable volume.*

On the other hand, the modulation depth / deviation must not be greater than the full-scale setting under SENSITIV AF OUTPUT, or a distorted signal will be obtained at the loudspeaker/headphones output even with the volume reduced.

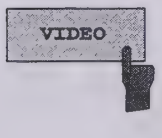
2.4.2.3 Triggering with Analog Demodulation - Softkey TRIGGER or Hardkey TRIGGER

Submenu: *CONFIGURATION MODE - VECTORANALYZER - ANALOG DEMOD - TRIGGER*



The *TRIGGER* softkey as well as the *TRIGGER* hardkey permit to call up the menu for setting the trigger.

The *FREE RUN* softkey activates a measurement without trigger. After a measurement has been terminated, data acquisition for a new measurement takes place immediately.



The softkey can only be operated with OFFLINE demodulation ***(REAL TIME OFF)***.

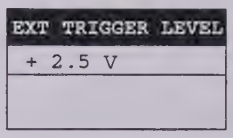
The *VIDEO* softkey starts the measurement by means of the video voltage of the analog path of the spectrum analyzer. For this purpose, the analog video voltage of the spectrum analyzer is analyzed parallel to the vector signal analyzer.

Video triggering is of particular use for frequency settling measurements on synthesizers.

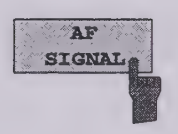
Video triggering requires the trigger threshold to be entered. It is identical with the trigger threshold of the spectrum analyzer. The trigger threshold is entered numerically into the data input field in % of the last grid that was active in spectrum analysis mode.

To determine the appropriate value for the trigger threshold in a measurement, the respective threshold can be determined in the spectrum analysis mode.

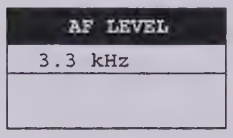
The *EXTERN* softkey activates triggering via an external voltage in the range from - 5 V to + 5 V at the BNC connector EXT TRIGGER / GATE (rear panel). Enter the desired value in the data input field.



Like triggering on a video signal, external triggering is only possible with offline demodulation ***(REAL TIME OFF)***.



The *AF SIGNAL* softkey opens up a data input field where the level of the AF signal is entered as the trigger level for display of the time signal.

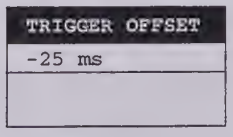


The AF trigger level is entered in %, Hz, deg or rad according to the current demodulation AM, FM or PM (in the case of AM DC in the current absolute level unit).

Triggering on the AF signal is similarly possible with ***REAL TIME ON/OFF.***

The *TRIGGER OFFSET* softkey opens up an input window for entry of the desired offset with video trigger or external trigger (only with **Real Time OFF**).

The softkey cannot be operated with ***REAL TIME ON*** and ***REAL TIME OFF*** in conjunction with AF trigger.



TRIGGER OFFSET is used to determine the start of data acquisition relative to the trigger event. Both positive values for a trigger delay and negative values for a pretrigger are permissible.

The input is made in absolute time irrespective of the scale selected for the X-axis.

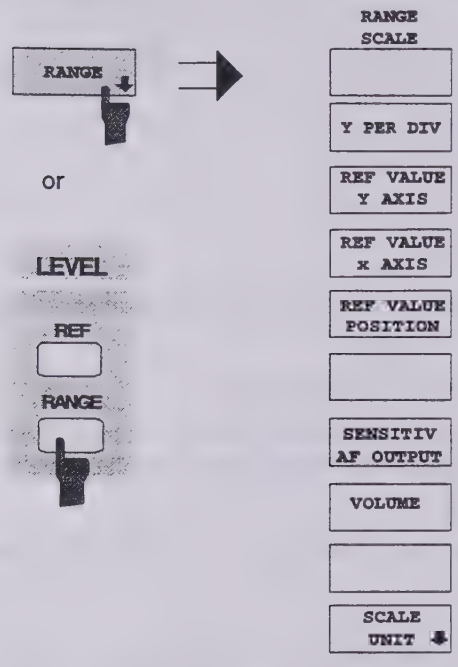
Depending on the Demod BW, values from 1µs to at least 10 ms are permissible for positive values of the trigger offset (trigger delay). The value range for negative trigger offset values (pretrigger) depends on the SWEEP TIME and is maximally half the SWEEP TIME.

The *SLOPE POS/NEG* softkey determines the trigger edge for triggering y means of the video signal, AF signal or external trigger.
The measurement run is started on a positive or negative edge of the trigger signal. With free-running trigger (*FREE RUN*), the setting is not of any significance.

2.4.2.4 Setting the Display Range and the Scaling - Softkey RANGE or Hardkey RANGE

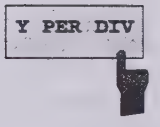
The menu for setting the range differs from that in the signal analysis mode.

Submenu: *CONFIGURATION MODE - VECTORANALYZER - ANALOG DEMOD - RANGE*



The *RANGE* softkey as well as the *RANGE* hardkey are used to call up a menu, which contains all the parameters important for the vertical axis (y-axis) and the horizontal axis of the screen display of the AF signal, such as reference values, scaling, etc.

In addition, with real-time demodulation, the slope of the AF output as well as the volume of the loudspeaker or headphones connector can be set here.



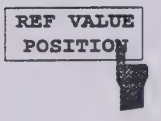
The *Y PER DIV* softkey indicates the vertical scaling in the current unit.

Hz or % are set for AM or FM, respectively. PM permits to choose between the units deg and rad (default status: rad).

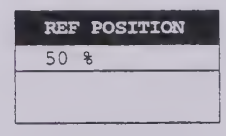
For the relative value display of the modulation summary, it is possible to choose between % and dB (default setting dB).

The *REF VALUE Y AXIS* softkey prompts the user to enter the reference value for the Y-axis of the diagram.

The reference value is entered in the respective display unit (see *UNIT*).

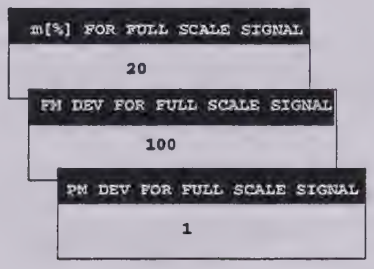


The *REF VALUE POSITION* softkey opens up an input window, in which reference value positions deviating from the default setting are set.



REF VALUE POSITION determines the position of the reference value. It is normally 50 % when the AF signal is displayed.

The *SENSITIV AF OUTPUT* (sensitivity AF output) softkey is used to set the scaling of the AF output with real-time demodulation. Depending on MEAS RESULT (AM, FM, or PM signal), an input field appears, where the modulation amplitude is to be entered at which the dynamic range of the AF output is fully utilized.
(Peak voltage 1V):



SENSITIV AF OUTPUT also affects the volume of the loudspeaker and the headphones output.

Only with real-time demodulation *(REAL TIME ON)*:

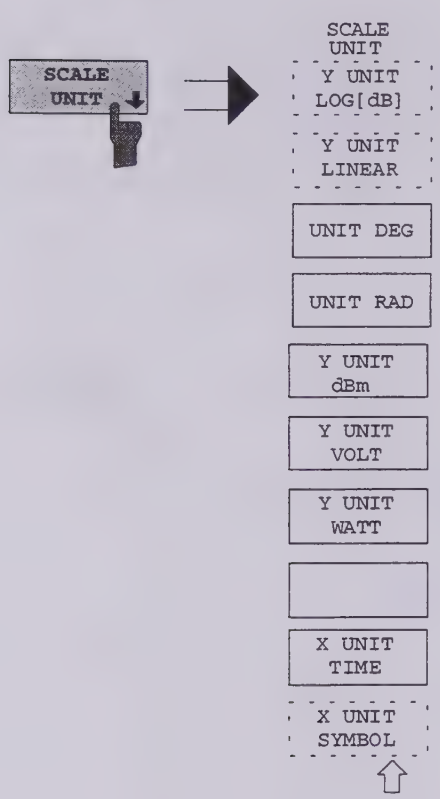
With real-time demodulation, the *VOLUME* softkey sets the volume of the demodulated signal (loudspeaker and headphones output) according to the slope of the AF output.

With ***REAL TIME OFF*** *(*no real-time demodulation*)* the outputs are switched off.

Note: *If the modulation depth / deviation is very small, the scaling of the AF outputs (Softkey* SENSITIV AF OUTPUT*) is to be matched to achieve a usable volume.*

On the other hand, the modulation depth / deviation must not be greater than the full-scale setting under SENSITIV AF OUTPUT, or a distorted signal will be obtained at the loudspeaker/headphones output even with reduced volume.

Submenu: *CONFIGURATION MODE - VECTORANALYZER - ANALOG DEMOD -* RANGE - *SCALE UNIT*



The *SCALE UNIT* softkey calls up a submenu for setting the unit of the Y-axis .

The units offered depend on the signal displayed, on the operating mode.

If a marker is switched on, the marker results are output in the current scale units.

With *ANALOG DEMODULATION,* the following Y-units are possible according to the type of modulation

AM:	AM[%],
FM:	Hz,
PM:	rad (default setting) or deg.

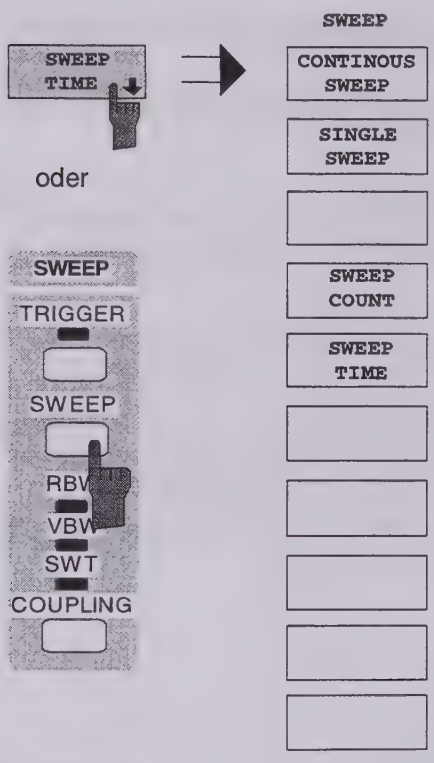
(With AM and FM, the units cannot be selected).

With time display of the AM signal and *AF COUPL'G DC* selected, the AM-demodulated signal is not standardized, but scaled in absolute levels.

Possible units are dBm, V and W. The default unit is dBm.

2.4.2.5 Sweep Menu with Analog Demodulation - Softkey SWEEP TIME or Hardkey SWEEP

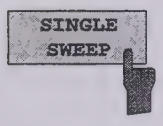
Submenu: *CONFIGURATION MODE - VECTORANALYZER - ANALOG DEMOD - SWEEP TIME*



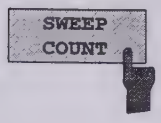
The *SWEEP* key calls up a menu, which permits to determine the type of measurement - single measurement or continuous measurement - and the length of the measurement results to be displayed in terms of time.

The *CONTINUOUS SWEEP* softkeystarts a continuous measurement in accordance with the trigger condition and the selected test settings. Triggering is followed by data acquisition first and then by evaluation and display on the screen.

If, with split screen display, vector analysis mode is used for measurement in both windows, the data in the measurement RAM are used for both evaluations.



The *SINGLE SWEEP* softkeystarts n measurements in accordance with the trigger settings. The number of measurement runs n is determined by means of *SWEEP COUNT*. The measurement stops after n measurements. It can be restarted by pressing the *SINGLE SWEEP* or *CONTINUOUS SWEEP* softkey again.



The *SWEEP COUNT* softkey opens up an input field in which the number of measurements is determined for the *SINGLE SWEEP*.

The number of measurements can be selected between 0 and 32767.

If averaging of the measured values is set (*AVG/HOLD ON*, *MODULATION MARKER*: *RMS* to be found under the *MARKER SEARCH key*), *SWEEP COUNT* also determines the number of measurements used for averaging.

If *SWEEP COUNT* = 0, 10 measured values are always used for **floating** averaging.

If *SWEEP COUNT* = 1, no averaging takes place.

If *SWEEP COUNT* >1, the average is taken of the set number of measured values.

SWEEP TIME is used to define the time during which the demodulated signal is to be displayed.
The maximum time is determined by the demodulation bandwidth set and the buffer length for the demodulated signal, which is 5000 points with analog demodulation.
Thus, the following settable maximum time is obtained:

$$\text{SWEEP TIME}_{max} = \frac{5000}{0.8 * (\text{DEMOD\_BW})} \text{ [s]}$$

A minimum of 10 points can be displayed, which means for the minimum settable time:

$$\text{SWEEP TIME}_{min} = \frac{10}{0.8 * (\text{DEMOD\_BW})}$$

Example:
With Demod BW 1kHz, the maximum and minimum time scale is as follows:
TIME/DIV_{max} = 6.25 s
TIME/DIV_{min} = 12.5 ms

The *RESULT LENGTH* softkey cannot be operated with ANALOG DEMODULATION.

Example: Measurement of amplitude modulation

Measurement of a carrier modulated with 1 kHz, 50 % at 100 MHz, level 0 dBm

1. Default setting [**PRESET**]
2. Frequency setting [**CENTER:** 100 MHz]
3. Level setting [REF LEVEL: +6 dBm], (the max. level of AM-modulated signals is 6 dB above the nominal level with 100 % AM).
4. Selection of vector analysis mode [**MODE**: *VECTOR ANALYSIS*]
5. The FSE is in the analysis mode ***DIGITAL DEMODULATION*** (default setting).

   Switch to analog demodulation [*ANALOG DEMODULATION*]. The AM-modulated signal appears on the display (display in the time domain, the default setting for [ANALOG DEMODULATION] is AM-SIGNAL).

   The demodulation bandwidth (analysis bandwidth) is 100 kHz in the default setting, i.e. audio signals up to max. 0.4* demodulation bandwidth can be demodulated.

   The demodulation bandwidth is changed eg to 30 kHz using *DEMOD BW: 30 kHz.*

6. Trigger setting to achieve a stable display: [**TRIGGER**:AF SIGNAL 0%]]

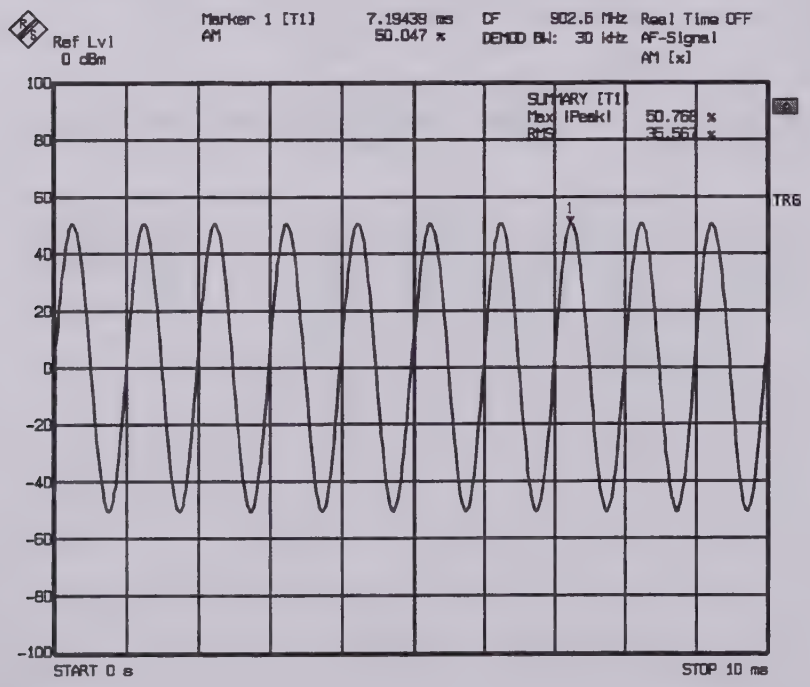
   The display of the AF signal at the left edge of the screen starts at 0 %.

7. Setting of the sweep time. The sweep time depends on the demodulation bandwidth and the sampling points provided (=5000 with analog demodulation). With a demodulation bandwidth of 30 kHz, the max. sweep time is 208 ms in the default setting. The sweep time 100 ms is set by means of:

   [**SWEEP**: SWEEPTIME 10 ms]

8. Activating the summary marker for numeric trace evaluation.

   [MARKER SEARCH: SUM MKR ON]



2.4.3 Digital Modulation Methods

In modern mobile radio networks digital transmission methods are used to avoid the disadvantages of a transmission channel in mobile communication and to be able to serve more subscribers in the available frequency spectrum. The FSE offers all commonly used demodulators for digitally modulated signals. All modulation parameters for standard transmission methods can be loaded as required by the user. The FSE determines all relevant modulation parameters such as frequency, phase, amplitude and vector errors, etc. Measurements are carried out on continuous as well as pulsed signals such as TDMA signals. Bit patterns can be defined to be able to trigger to known bit sequences like preambles or midambles. The demodulator requires neither a coherent carrier nor a symbol clock for demodulation. It comprises matched filters and synchronizes automatically to the carrier and to the symbol clock. Furthermore, the demodulator can generate the ideal I/Q signal from the demodulated bit stream and thus determine the errors of the analyzed signal.

For a correct demodulation of digital signals, a number of modulation parameters in addition to the modulation mode has to be specified for the signal to be analyzed. The most important are the symbol rate and the input filter. And in addition, the frequency of the FSE (approx. 2% of the symbol rate) has to be tuned exactly to the frequency of the signal to be analyzed.

The bandwidth for demodulation is a function of the symbol rate and the selected oversampling method (*POINTS PER SYMBOL*). At least 4-fold oversampling is performed. If the number set under *POINTS PER SYMBOL* is reduced, fewer points are used in the display. The demodulation bandwidth for 1, 2 and 4 points per symbol is 3.125 times the symbol rate, with 8 points per symbol 6.5 times and for 16 points per symbol 13 times. It should be ensured that no modulation spectrum of adjacent signals is within the displayed range during demodulation, as this may introduce errors in the measurement of modulation parameters. If required, check for correct settings in the analyzer mode. The block diagram below shows the digital demodulator and its measurement capabilities:

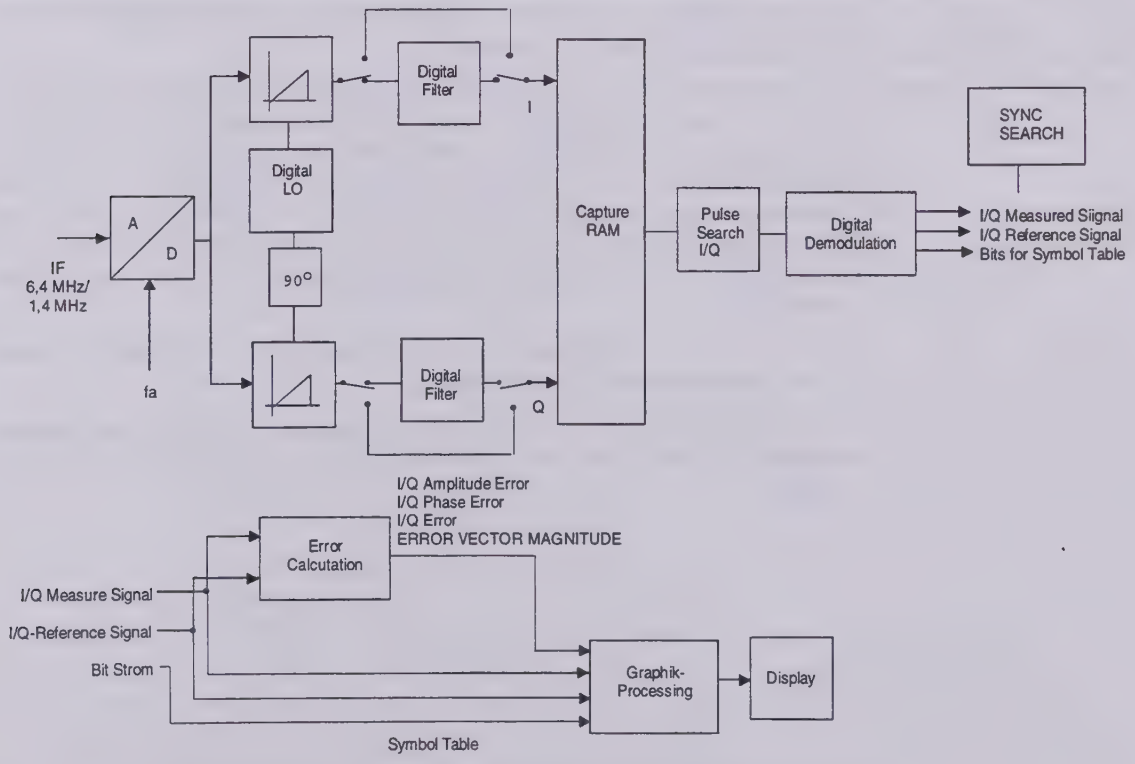
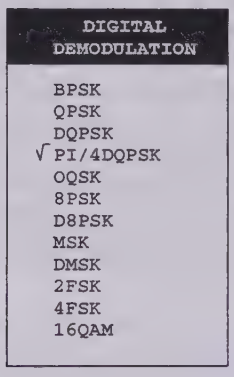


Fig. 2.4-2 Block diagram for signal processing during digital demodulation

2.4.3.1 Selecting the Digital Demodulators

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER*

The *DIGITAL DEMOD* soft key opens a list of all available demodulators .



Demodulators are provided for the two-, four- and eight-level phase modulation modes BPSK, QPSK and 8PSK. For QPSK and 8PSK demodulation, the demodulators for differential signals DQPSK and D8PSK can be selected additionally.

Demodulators are also availabe for the special versions of QPSK modulation, such as differential QPSK with $\pi/4$ phase offset ($\pi/4$-DQPSK) and offset QPSK (OQPSK).

QPSK is used, for instance, by the Qualcomm CDMA for modulating signals from the base station to the mobile, OQPSK for signals from the mobile to the base station. The American TDMA system NADC (IS54) uses $\pi/4$-DQPSK for digital signal transmissions.

For higher-level modulation modes the demodulator for 16QAM is available. MSK (minimum shift keying) demodulators pertain to the group of continuous-phase demodulators. MSK with Gaussian filters (GMSK = Gaussian minimum shift keying) is used for the European mobile radio systems GSM and DCS1800 or PCS1900 in the USA. For correct bit detection for GSM, DCS 1800 and PCS 1900 and 1800 the MSK demodulator with additional differential decoding (DMSK) should be activated.

For FSK (frequency shift keying modulation, two-level (2FSK) and four-level (4FSK) demodulators can be selected.

2FSK modulation methods are used for instance for the digital cordless telephone to DECT standard, 4FSK for the paging system to ERMES standard.

2.4.3.2 Standard Settings

To simplify the selection of parameters when standard transmission methods are used, standard setups are available in the FSE. All modulation parameters are set automatically.
Table 2.4-1 shows available standards and respective settings.)

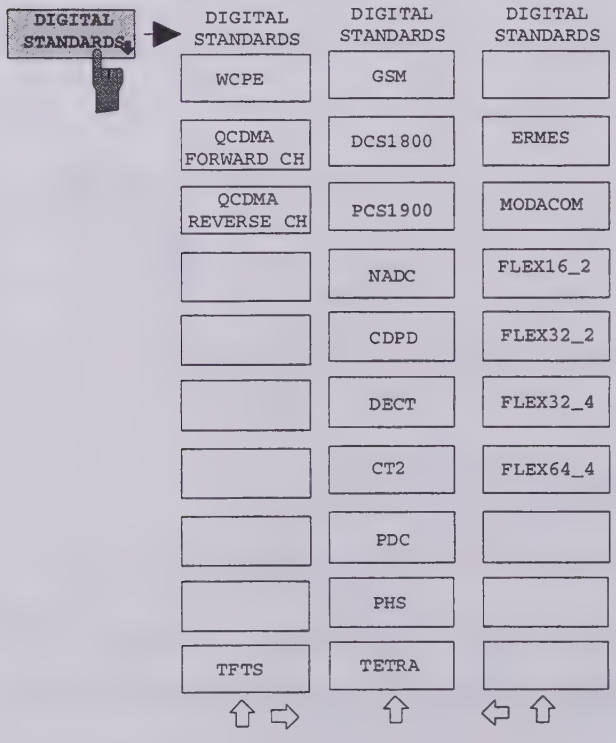
For the GSM, DCS1800 and PCS 1900 standards the sync pattern GSM_BTS0 with the associated synchronization offset of 61 symbols is preset in addition. When selecting the NADC standard, the instrument is set to the burst of the base station with a slot length of 162 symbols. For the burst of the mobile station, the result length has to be reduced to 156 symbols after selection of the NADC standard according to the shorter slot length. In this case the sync offset is 8 symbols.
For the DECT standard the sync pattern of the fixed part DECT_FP is preset, the sync offset is set to 0.
When selecting the TETRA standard, the sync pattern Tetra_1 is preset, the sync offet is preset to 122.

Sync pattern and sync offset become active be switching SYNC SEARCH on.

Note: *The pager standards ERMES and FLEX (2FSK and 4FSK modulation) feature modulation filters with increased bandwidth (B*T> 1). This means that with normal oversampling (4 points per symbol) there is an intolerable bandwidth restriction which causes a distinctly higher demodulation error probability. Therefore the number of points per symbol is preset to 8 when the ERMES standard is selected and to 16 when the FLEX standard is selected.*

Attention: *In case of departures from the preset value (which may happen automatically when increasing the frame length or result length) there is a higher system error probability.*

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER*



The *DIGITAL STANDARDS* soft key calls up a submenu of available standard setups.

If one of the following modulation parameters is modified, any digital standard that may be selected is switched off automatically:

- Symbol rate
- Measurement filter
- Reference filter
- α/BT

Table 2.4-1 Standard setups

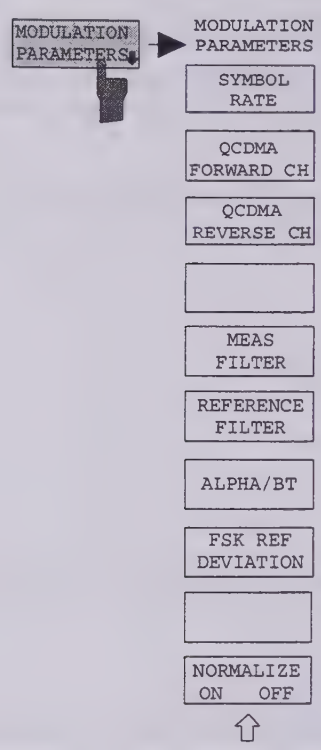
Modulation/ Standard	Symbol rate	Filter		Alpha BT	Synchro-nization	Sync Pattern	SYNC OFFSET	Points/ symbol
		Measurement filter	Reference filter					
GSM, (DCS1800, PCS 1900) MSK	270.833 kHz	NONE	GAUSSIAN	0,3	PULSE SEARCH	GSM_BTS0	61	4
NADC*) π/4 DQPSK	24.3 kHz	ROOT RAISED COS	RAISED COS	0,35	SYNC SEARCH	NADC_S1	0	4
PDC π/4 DQPSK	21 kHz	ROOT RAISED COS	RAISED COS	0,5	PULSE SEARCH	PDC_S1	57	4
PHS π/4 DQPSK	192 kHz	ROOT RAISED COS	RAISED COS	0,5	PULSE SEARCH	PHS_DO1	32	4
CDPD MSK	19,2 kHz	NONE	GAUSSIAN	0,5	--	--	--	4
DECT 2-FSK	1152 kHz	NONE	GAUSSIAN	0,5	VIDEO TRIGGER + PULSE SEARCH	DECT_FP	0	4
TETRA π/4-DQPSK	18 kHz	ROOT RAISED COS	RAISED COS	0,35	PULSE SEARCH	TETRA_1	122	4
CT2 2-FSK	72 kHz	NONE	GAUSSIAN	0,5	PULSE SEARCH	CT2_CFP	0	4
ERMES 4-FSK	3.125 kHz	NONE	BESSEL 1_25		--	--	--	8
MODACOM 4-FSK	4.8 kHz	ROOT RAISED COS	RAISED COS	0,2	--	--	--	4
FLEX 16_2 (FLEX 1600) 2-FSK	1.6 kHz	NONE	BESSEL 2_44	--	--	--	--	16
FLEX 32_2 (FLEX 3200) 2-FSK	3.2 kHz	NONE	BESSEL 1_22	--	--	--	--	16
FLEX 32_4 (FLEX 3200 4-FSK	1.6 kHz	NONE	BESSEL 2_44	--	--	--	--	16
FLEX 64_4 (FLEX 6400) 4-FSK	3.2 kHz	NONE	BESSEL 1_22		--	--	--	16
WCPE π/4 DQPSK	562.5 kHz	ROOT RAISED COS	RAISED COS	0,5	PULSE SEARCH	WCPE_FP1	0	4
QCDMA FORWARD CH QPSK	1.2288 MHz	QCDMA_FM	QCDMA_FR	--	--	--		
QCDMA REVERSE CH OQPSK	1.2288 MHz	QCDMA_RR	QCDMA_RR	--	--	--		
TFTS π/4 DQPSK**)	22.1 kHz	NONE	RAISED COS	0,4	PULSE SEARCH	TFTS_G1	0	

*) The standard setting is matched to the slot of the NADC base station. As the base station doesn't burst, the FIND BURST function is disabled.
In order to measure a mobile station (reverse channel), the result length must be set to 156 symbols, the sync offset to 8 symbols, correspondingly. The find burst function must be switched on for measuring a mobile station!

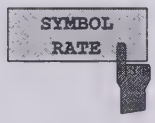
**) When selecting the TFTS standard, the special bit decoding is made according to the TFTS standard.

2.4.3.3 Selecting Modulation Parameters for Digital Demodulation

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER*



The *MODULATION PARAMETERS* soft key calls up a submenu for setting the modulationparameters.

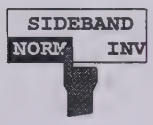


The *SYMBOL RATE* soft key opens a window for entering the symbol rate of the digitally modulated signal to be measured.

The symbol rate is a function of the bit rate determined via the modulation level and corresponds to the baud rate. With QPSK, for instance, the symbol rate corresponds to half the bit rate (= 2 bits per symbol). Symbols are only valid while the signal is evaluated by the receiver. The time of demodulation is the point of decision. The demodulator of the FSE uses the set symbol rate to find the points of decision.

To be able to select the correct symbols, the symbol rate has to be entered exactly. The more complex (high-level) the modulation method, the more critical the exact definition of the symbol rate. An inaccurately defined symbol rate causes demodulation errors. The settings below should also be observed for selecting the symbol rate:

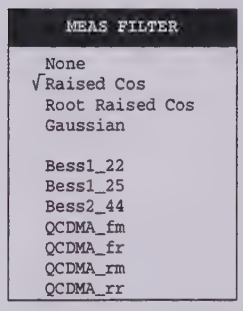
- Maximum permissible symbol rate is 2 MHz.
- The number of points per symbol is limited to 8 for symbol rates >200 kHz and to 4 for symbol rates >400 kHz.



The *SIDEBAND INV (INVERTED)* soft key allows to demodulate the received signal in the inverse position.
For FSK, this means that the frequency states are inverted. Otherwise (not FSK demodulation), I and Q are inverted.
The default state is *SIDEBAND NORM* (*NORMAL*, normal position).

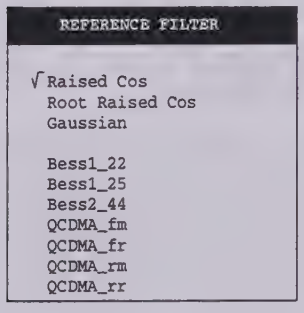
One possible application for the *SIDEBAND INVERTED* function is correct symbol decoding for measurements of the IF for a system with inverse conversion.

The *MEAS FILTER* soft key selects the input filter for the signal to be measured. The required filter is selected in a table:



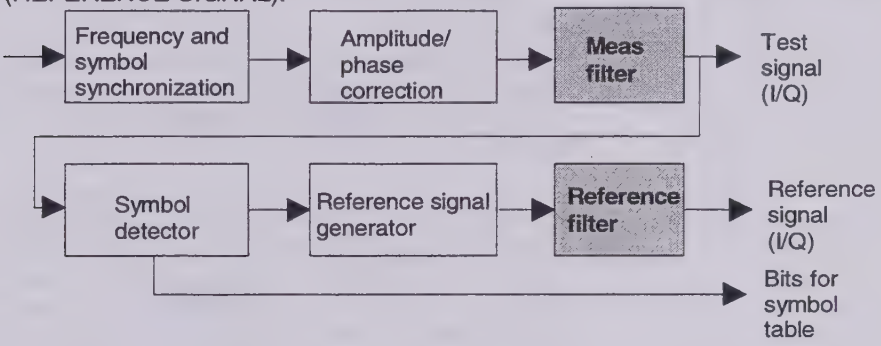
Further information is given in the description of the *REFERENCE FILTER* soft key.

The *REFERENCE FILTER* soft key selects the filter for the ideal reference signal for detecting modulation errors at the baseband level. The required filter is selected in a table:



Predefined filters are the squarewave filter (only MEAS FILTER:NONE), the raised cosine filter, the root raised cosine filter and the Gaussian filter. Cosine filters are generally used for phase modulation, Gaussian filters by MSK and FSK modulators.The filter parameters are set via *ALPHA/BT*.

The digital demodulator of FSE generates two signals at the I/Q level, the signal to be measured (*MEAS SIGNAL*) and the reference signal (*REFERENCE SIGNAL*).



The signal to be measured is present at the RF input after demodulation. The reference signal is the signal that would be obtained in the case of an ideal RF signal. A separate filter is provided for the signal and the reference signal.
For digital transmissions, filtering can be carried out at the transmitter or receiver end or be split up between both. The filter at the receiver is the measurement filter. The reference filter is used for the total system. Depending on the configuration of filters, the following combinations can be used:

Filters of transmission system		Filters to be selected	
Transmitter	Receiver	MEAS FILTER	REFERENCE FILTER
Root-raised cos	Root-raised cos	Root-raised cos	Raised cos
Raised Cos	none	none	Raised cos
Gaussian	none	none	Gaussian

If no modulation filter is provided in the transmitter, it may also be useful to employ a RAISED COS or GAUSSIAN filter as measurement filter. However, the non-existing band limiting at the FSE input may cause unwanted aliasing products in the vector analyzer mode, which might impair the measurement. A measurement without reference filter is not possible!

If an input filter is used for demodulation or a filter for generating the reference signal, the filter characteristic has to be determined by means of *ALPHA/BT*. With Nyquist filters *ALPHA* has to be specified, with Gaussian filters the product of the symbol period T and bandwidth B (*BT*).

The A*LPHA/BT* soft key opens a window where the roll-off factor (*ALPHA*) for the cosine filters or the bandwidth/symbol period product *BT* for the Gaussian filters is entered. All filters are computed up to a length of 16 symbols.

Permissible input values are 0.2 to 3 in steps of 0.05. The value for *ALPHA/BT* applies to the measurement and to the reference filter. Values for *ALPHA* or *BT* are determined by the digital transmission system. These values should be used for measurements with FSE as higher demodulation errors could otherwise occur.

For *ALPHA/BT >1*, the demodulation bandwidth with sampling of 4 points per symbol is usually not sufficient. In this case it is recommended to set the number of points per symbol to 8 or 16. See also the note under DIGITAL STANDARDS. *ALPHA* describes the transmission characteristic of a Nyquist filter (cosine filter). It is also designated as roll-off factor or bandwidth factor. The greater ALPHA, the greater is the bandwidth occupied by the digitally modulated signal relatives to the theoretical minimum. In digital transmission systems typical bandwidth factors of 0.25 to 0.5 are used, ie the occupied bandwidth is 25% to 50% larger than the theoretical minimum. The bandwidth/time product *BT* describes the characteristic or the bandwidth factor of Gaussian filters.

The *FSK REF DEVIATION* soft key opens a window for entering the reference deviation for FSK demodulation.

FSK deviation is defined as the (unilateral) deviation from the center frequency occurring in the case of modulation with constant 0 or 1 sequences, ie the stationary value.

For 4 FSK, the modulation deviation is the deviation from the center frequency for the bit sequences causing maximum frequency deviation.

The reference deviation is used for computing the deviation error in *NORMALIZE ON* mode

NORMALIZE
ON OFF

The *NORMALIZE ON/OFF* soft key has the following effect:
The measurement result in the vector and constellation diagram is always normalized to a circle, the radius of which corresponds to the mean distance between the center of the circle and the mid-points (of all groups of sampling values).
This circle is defined as a unit circle with the radius 1.

Softkey *NORMALIZE ON* shifts the center of the unit circle by the I/Q offset to the center for the group mid-points. *NORMALIZE ON* is the default state:

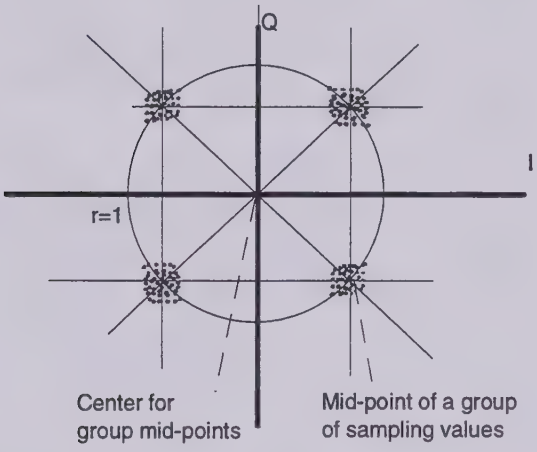
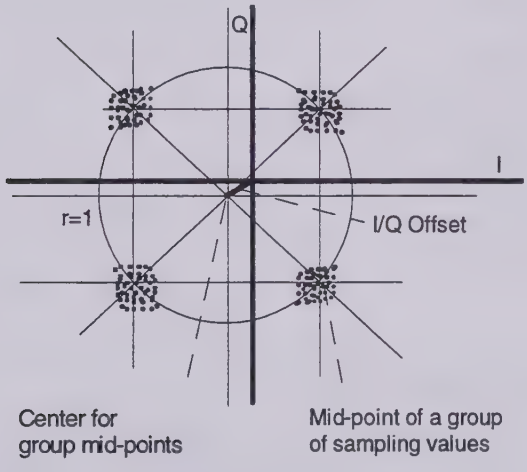


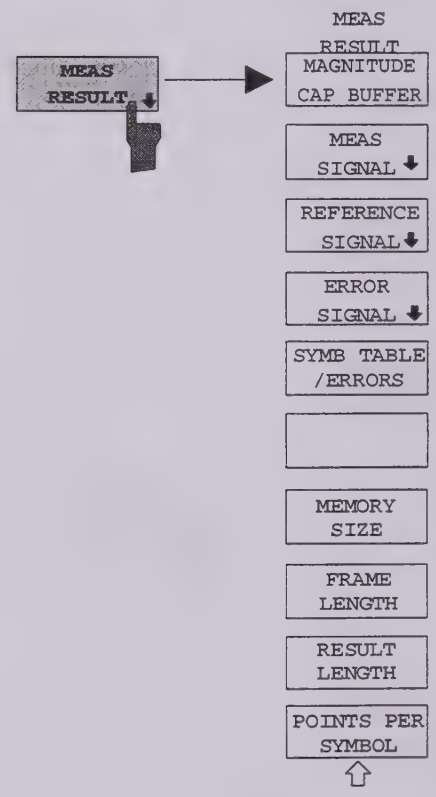
Diagram in the case of *NORMALIZE OFF*:



2.4.3.4 Selecting Measurement Results for Digital Demodulation

After entering all modulation parameters the required measurement is selected using the *MEAS RESULT* soft key. The contents of the trace memory (magnitude), the demodulated measurement signal, the reference signal, i.e. the ideal signal derived from the measurement signal, or the error signal can be displayed as the measurement result. The I/Q error and the vector error are the two possible error signals. A table is available listing all errors together with the demodulated bits.

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER*



The *MEAS RESULT* soft key opens a submenu in which the different displays for the measured signal can be selected.

The *MAGNITUDE CAP BUFFER*, *MEAS SIGNAL*, *REFERENCE SIGNAL*, *ERROR SIGNAL* and *SYMB TABLE/ERRORS* soft keys are selection switches, i.e. only one of the measurement results offered can be selected per screen. If two screens are available, (split-screen mode) a different measurement result can be displayed in each screen.

When the measurement signal, the reference signal and the error signal are displayed, submenus are called up by the corresponding soft keys and the associated parameter can be set.

Moreover, soft keys are available for setting the memory size, the number of bits to be demodulated and displayed.

2.4.3.4.1 Magnitude of Capture Buffer

The capture buffer is the memory comprising the samples that are entered during the storage of measured values. These samples are used for demodulation but are retained over the complete measurement. A reason for this is the loss in the dynamic range during the synchronization and demodulation of the signal. For synchronization, an interpolation between the samples is necessary, for example, for determining the symbol decision point accurately. Interpolation is always synonymous with a loss in the amplitude dynamic range. In case of synchronization, the signal has to be normalized. The normalization is also linked with a loss in the dynamic range.
When measuring the power ramping of a TDMA burst, a maximum dynamic range is required. This dynamic range is obtained when using the capture buffer for samples.

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULT*

The *MAGNITUDE CAP BUFFER* soft key indicates the magnitude of the signal in the capture buffer in the time domain.

The *MAGNITUDE CAP BUFFER* mode is therefore recommended in all cases where power ramping of TDMA bursts should be measured with a wide dynamic range. Timing will be accurate to less than or equal to half a clock period of the sampling unit

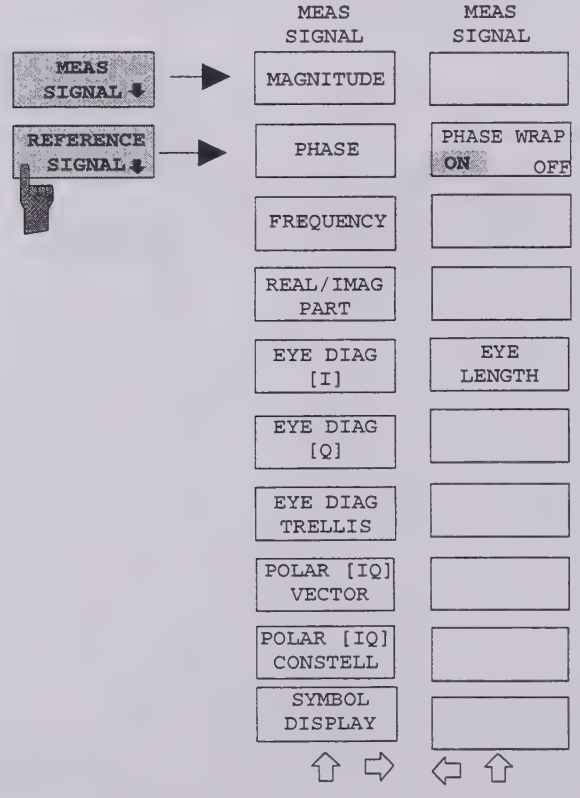
Example:
A signal is sampled with 8 values per symbol. The maximum timing error of the TDMA burst synchronized to a bit sequence is 1/16, i.e. 6.25% of the symbol period.

2.4.3.4.2 Measurement or Reference Signal

The FSE can display both the waveform of the measurement signal, which is derived from the samples in the baseband, and that of the reference signal. To this effect, the measurement signal is filtered and synchronized to the carrier and the symbol clock. The I/Q offset and the amplitude reduction of the signal is compensated prior to the display. The reference signal is generated from the demodulated bits by modulation down to the baseband. It is identical to the measurement signal freed of modulation errors and noise.
The output formats for the measurement signal and the reference signal are identical. The output formats are different for FSK demodulation and all other demodulation modes.

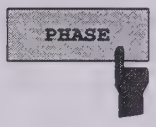
Output formats for non-FSK demodulation:

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULT*



The *MEAS SIGNAL* and *REFERENCE SIGNAL* soft keys call up identical submenus. The output formats of the two signals can be selected there.

The *MAGNITUDE* soft key displays the magnitude of the demodulated measurement or reference signal, which is normalized to 1, as a function of time and symbol.



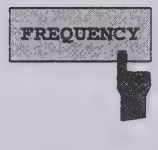
The *PHASE* soft key displays the phase of the measurement or reference signal.

The *PHASE WRAP ON/OFF* soft key activates/deactivates a phase shift.

The phase of a signal can have very high values due to the modulation. Therefore, scaling should be very coarse to display the phase over many bits. FSE therefore offers the phase to be shifted by means of the *PHASE WRAP ON/OFF* soft key.

ON The FSE displays the phase in the range of ±180°. If the phase exceeds +180°, for example, 360° is subtracted from the phase value so that >-180° is indicated. This avoids very high phase values to be displayed which would impair the reading accuracy.

OFF The phase is not shifted. It is displayed within the range of the Y axis. Phase values above or below this range are cut off at the diagram edges.



The *FREQUENCY* soft key displays the time or symbol-dependent frequency response of the signal, i.e., the frequency-demodulated signal. The soft key is only available for MSK demodulation.

The frequency display is suitable for measuring the frequency deviation by using the markers.

The *REAL/*IMAG *PART* soft key calls up the display of the real and imaginary parts of the measurement or reference signal in separate diagrams.
To this effect, the diagram is split up. The real part is displayed in the upper half whereas the imaginary part is displayed in the bottom half. The X axis (which is scaled in time units or symbols) is identical for the two diagrams.

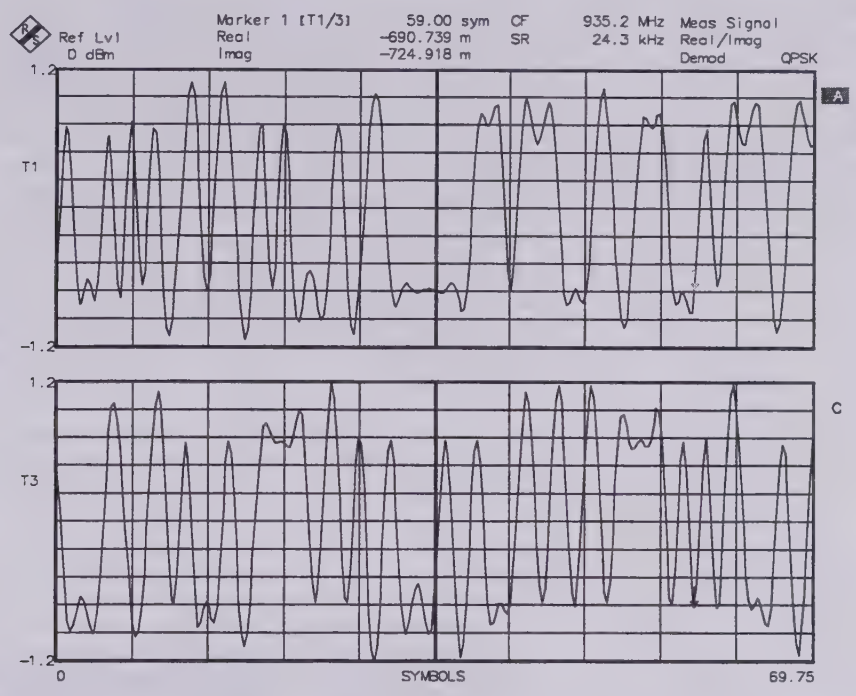


Fig. 2.4-5 Simultaneous display of inphase and quadrature component in a single diagram (here: screen A in split-screen display)

The *EYE DIAG [I]*, *EYE DIAG [Q]* and *EYE DIAG TRELLIS* soft keys select the various eye diagrams:

- eye diagram for the inphase signal,
- eye diagram for the quadrature signal and
- trellis diagram.

The eye diagram is the representation of inphase and quadrature signal (*EYE DIAG [I] or EYE DIAG [Q]*) as a function of time. It is triggered by the symbol clock at the points of decision. The number of states on the time axis is determined by soft key *EYE LENGTH*.

The individual traces of the eye diagram are superimposed on each other until the number of symbols specified with *RESULT LENGTH* is attained. The successive traces are the continuation of the trace written last, i.e. the total trace is displayed in a folded form. To obtain a complete eye diagram, all the states of a signal have to be traced at least once. The number of eyes corresponds to the number of modulation states less 1. The eye aperture is a measure for differentiating between two decision levels. A small eye apertures indicate a high, large eye apertures a small bit error rate.

The trellis diagram is used for representing the states of continuous-phase modulation methods (e.g. MSK). It indicates the phase versus time and permits also phases above ±180° to be displayed. The trellis diagram is similar to the eye diagram in that measured traces are superimposed onto each other in the display until the number of symbols defined by *RESULT LENGTH* is attained.

For the FSE, the trellis diagram is particularly useful for testing MSK and GMSK modulation. The symbols are spaced by 90°. A phase shift of +90° corresponds to logic 1, a shift of -90° to logic 0. A rising phase edge therefore indicates a logic 1, a falling edge a logic 0. Same as with the eye diagram, the width of the trellis diagram is defined by *EYE LENGTH*. To obtain a clear display, a minimum of 5 symbols should be selected as display width.

The number of P*OINTS PER SYMBOL* should be as high as possible to obtain a continuous trace in the eye diagram. 8 to 16 points are recommended.

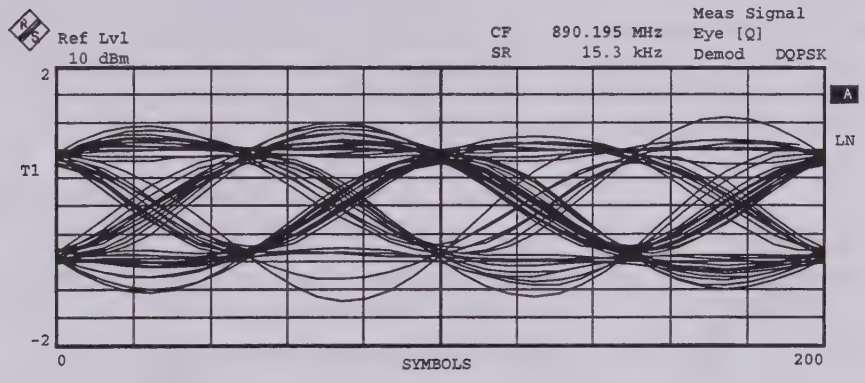
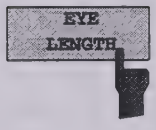


Fig. 2.4-6 Eye diagram over 200 symbols of a DQPSK-modulated signal. Five symbols are displayed.

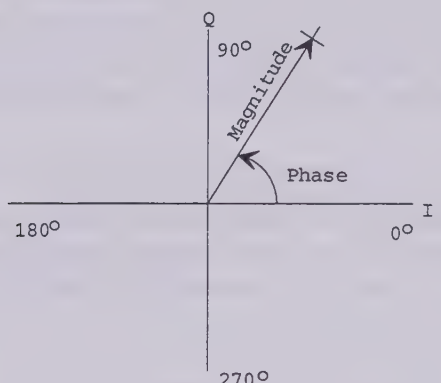


The *EYE LENGTH* soft key determines the display width of the eye diagram in symbols. The number of symbols is entered in the field.

At least one symbol length or two states are required for a complete eye. To be able to detect the errors particularly at the zero crossings, two to five symbols are recommended. The number of symbols is limited with *RESULT LENGTH*. In the case of *EYE LENGTH* = *RESULT LENGTH*, however, the signal versus time is displayed, the eyes are no longer visible.

The *POLAR [IQ] VECTOR and POLAR [IQ] CONSTELL* soft key display the trace in the form of a polar diagram. In the vector diagram, all the points are marked. In the constellation diagram only those at the points of decision.

In the I/Q diagram, the FSE displays the inphase component of the signal on the X axis, the quadrature component on the Y axis. Each trace represents a vector. The magnitude of the vector is the distance to the zero point, the phase is the angle between the positive X axis and the vector measured counterclockwise.



$$\text{Magnitude} = \sqrt{I^2 + Q^2}$$

Fig. 2.4-7 Vector in the I/Q diagram

In the vector diagram the number of points between the points of decision is determined with *POINTS PER SYMBOL*. For instance, if 5 points per symbol have been selected, every 5th point is a symbol at the point of decision. The other four points are intermediate values. The points of decision can be marked by selecting *DOTS* under *SYMBOL DISPLAY*.
The constellation diagram displays only the measurement values at the points of decision.

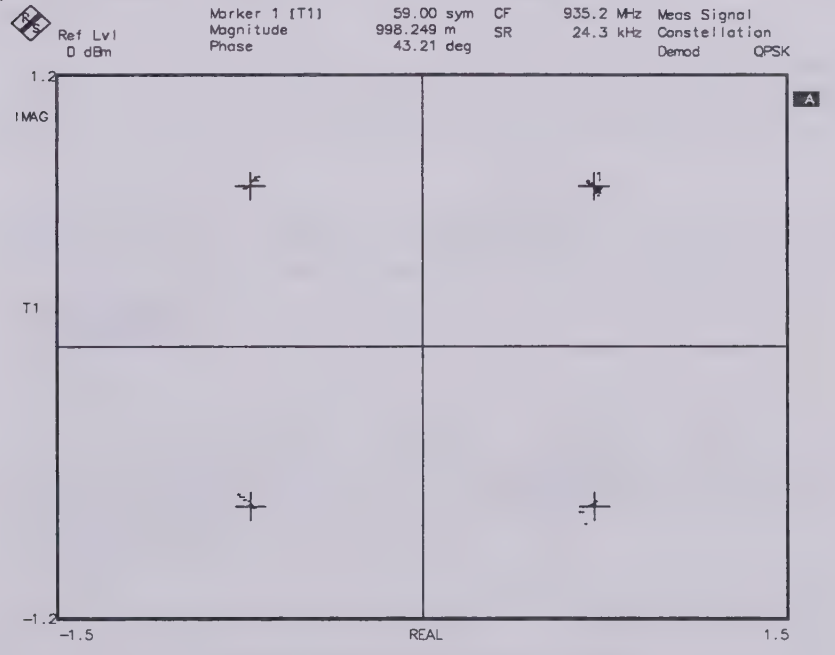
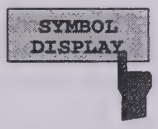
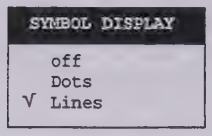


Fig. 2.4-8 Constellation diagram (example QPSK)



The *SYMBOL DISPLAY* soft key marks the symbol decision points in the displayed trace. The desired form of highlighting can be selected from the table. Points of decision can be marked by vertical lines or by means of dots.



With *off* selected, the points of decision are not marked. When *Dots* are selected, points are drawn on the trace and for *Lines*, (except for vector and constellation diagrams) vertical lines are drawn between the X axis and the trace.

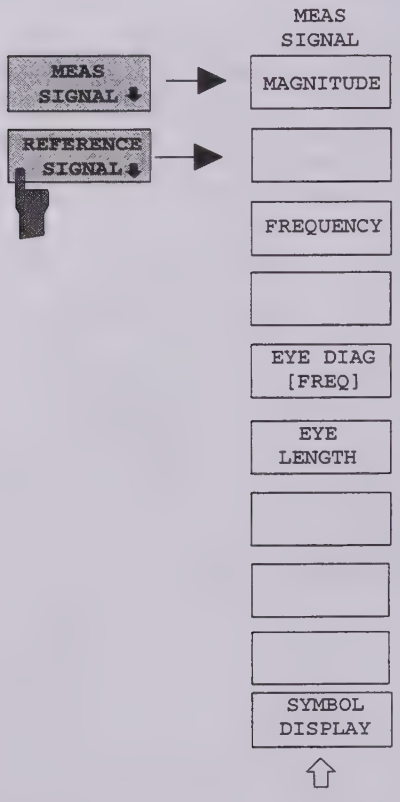
For vector and constellation diagrams dots are inserted with *Dots* **and** *Lines*.

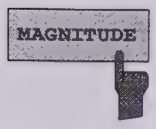
For the constellation diagram dots are also displayed even in the *off* mode.

This function is used for displaying the time characteristic of measurement results, e.g. as an I/Q characteristic or error signal.

Output formats with FSK demodulation:

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULTS*





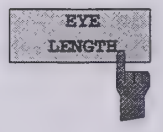
The *MAGNITUDE* soft key displays the magnitude of the demodulated measurement or reference signal as a function of time and symbol.

The *FREQUENCY* soft key displays the time- or symbol-dependent frequency response of the signal, i.e., the frequency-demodulated signal.

The frequency display is for instance suitable for measuring the frequency deviation by using the markers.

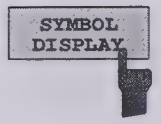
The *EYE DIAG [FREQ]* soft key displays the frequency-demodulated signal as a function of time. This signal is triggered by the symbol clock at the points of decision. The number of states on the time axis is determined by *EYE LENGTH.*

The individual traces of the eye diagram are superimposed on each other until the number of symbols specified with *RESULT LENGTH* is attained. The successive traces are the continuation of the trace written last, i.e. the total trace is displayed in a folded form. To obtain a complete eye diagram, all the states of a signal have to be traced at least once. The number of eyes corresponds to the number of modulation states less 1. The eye aperture is a measure for differentiating between two decision levels. A small eye apertures indicate a high, large eye apertures a small bit error rate.

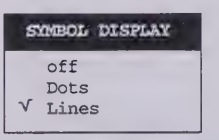


The *EYE LENGTH* soft key determines the display width of the eye diagram in symbols. The number of symbols is entered in the field.

At least one symbol length or two states are required for a complete eye. Two to five symbols are recommended however to detect the errors particularly at the zero crossings. The number of symbols is limited by *RESULT LENGTH.* In the case of *EYE LENGTH = RESULT LENGTH*, however, the signal versus time is displayed, the eyes are no longer visible.



The *SYMBOL DISPLAY* soft key marks the symbol decision points in the displayed trace. The desired form of highlighting can be selected from the table. Points of decision can be marked by vertical lines or by dots..



With *off* selected, the points of decision are not highlighted. When *Dots* are selected, points are drawn on the trace and with *Lines* selected (except for vector and constellation diagrams), vertical lines are drawn between the X axis and the trace.

2.4.3.4.3 Measurement of Modulation Errors

The FSE evaluates the modulation errors by comparing the measurement signal with the internally generated ideal reference signal. The different output formats of the error are selected by means of the *ERROR SIGNAL* soft key.

Non-FSK demodulation:

The modulation error of the measurement signal can be displayed separately, i.e. according to magnitude and phase, as I and Q error, error vector magnitude or, in polar diagrams, as vector or constellation diagram.

The magnitude and phase error are determined according to the following equations:

Error signal magnitude = $\sqrt{I^2 + Q^2} - \sqrt{I_{ref}^2 + Q_{ref}^2}$ and

Error signal phase = $\arctan\frac{Q}{I} - \arctan\frac{Q_{ref}}{I_{ref}}$, where

the real and imaginary part of the error signal are given as follows

Error signal real part = $I - I_{ref}$ and

Error signal imag part = $Q - Q_{ref}$

The magnitude of the error vector (error vector magnitude) is

$$EVM = \sqrt{(I - I_{ref})^2 + (Q - Q_{ref})^2}$$

I, Q = measured I/Q component
I_{ref}, Q_{ref} = I/Q components ideally calculated from the bit sequence.

The following vector diagram indicates the different types of errors resulting from the measurement signal and the reference signal:

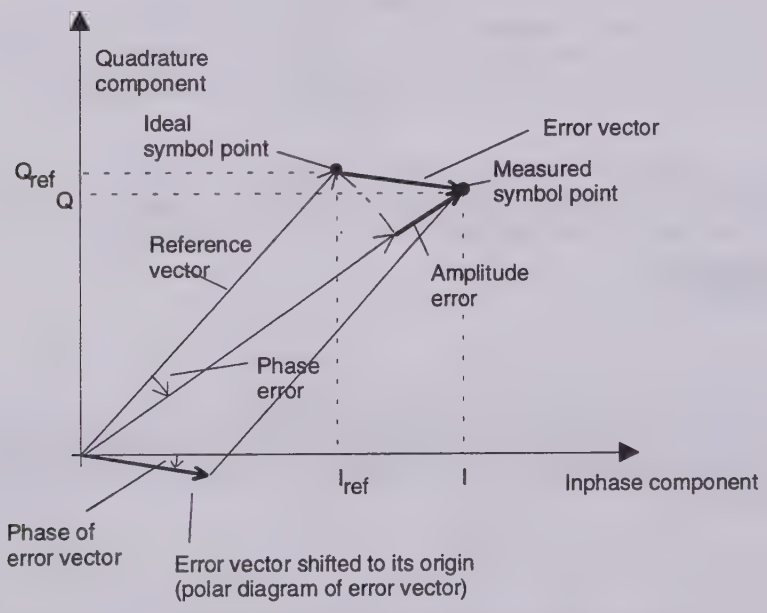
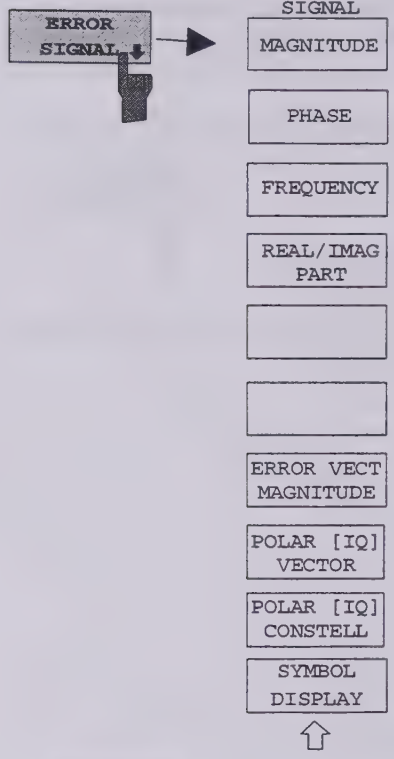


Fig. 2.4-9 Graphic display of modulation errors by means of a point of decision

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULT*



The *ERROR SIGNAL* soft key opens the submenu for selecting the type of error to be displayed.

The following types of error representation are available

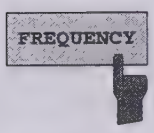
- amplitude error (MAGNITUDE)
- phase error (PHASE)
- frequency error (FREQUENCY)
- error if the real part (REAL/IMAG PART) and
- error of the imaginary part (REAL/IMAG PART)
- magnitude error (ERROR VECTOR MAGNITUDE)

For error representation the FSE compares all the points of the measurement and reference signal and displays them in the error diagram (except for *POLAR [IQ] CONSTELL*). Thus, the number of measurement results depends on the number of points per symbol. If only the errors are to be evaluated at the points of decision, the number of points per symbol has to be set to one.

To maintain the correct error for discontinuous transmission, e.g. for TDMA methods, make sure that only valid symbols are displayed. The result length and the trigger condition have to be set appropriately.

The *MAGNITUDE* soft key starts the point by point comparison of the magnitude of the measurement signal with the magnitude of the ideal signal. The difference of the two magnitudes is displayed..

The *PHASE* soft key starts the point by point comparison of the phase of the measurement signal with the phase of the ideal signal. The difference of the two phases is displayed as phase error.



The *FREQUENCY* soft key displays the frequency error. The frequency response of the measurement signal is compared with that of the ideal reference signal and the difference between the two responses is displayed as a function of time and symbol. The soft key is only available for MSK demodulation .

The *REAL/IMAG PART* soft key displays the error of the real and imaginary part in separate diagrams. To this effect, the measurement diagram is split up. The real part is displayed in the top half and the imaginary part in the bottom half. The X axis (time or symbols) is identical for the two diagrams.

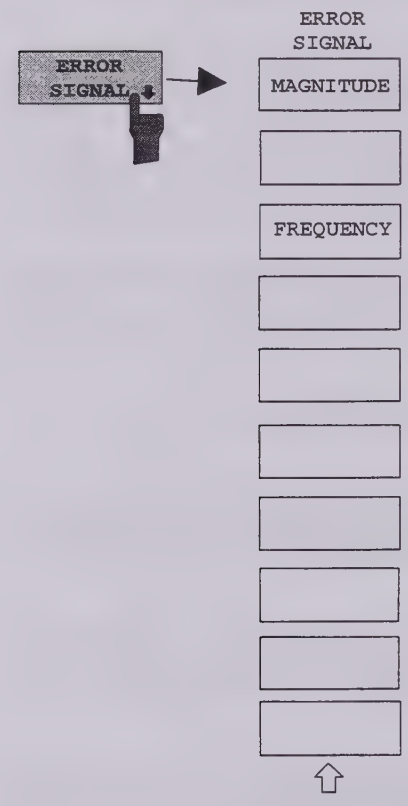
The *ERROR VECT MAGNITUDE* soft key displays the magnitude of the error vector versus time or symbols.

The *POLAR [IQ] VECTOR* and *POLAR [IQ] CONSTELL* soft keys display the error vector in the polar diagram. The error vector diagram and the error constellation diagram.

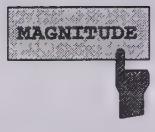
With these forms of representation, the points of decision are all shifted back to the origin and are laid on top of each other. The errors at the points of decision can thus be seen at a glance.

FSK demodulation:

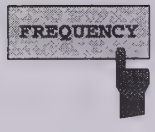
Submenu: *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULT*



The *ERROR SIGNAL* soft key opens the submenu for selecting the type of error to be displayed.



The *MAGNITUDE* soft key starts the point by point comparison of the measurement signal with the magnitude of the ideal signal. The difference of the two magnitudes is displayed..

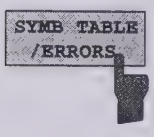


The *FREQUENCY* soft key displays the frequency error.
The frequency response of the measurement signal is compared with that of the ideal reference signal and the difference between the two responses is displayed as a function of time and symbol.

2.4.3.4.4 Symbol Table and Table of Modulation Errors

The symbol table and the table with modulation errors are indicated in the same display. In this case, the two tables are assigned to a trace. Similar to the trace display, the corresponding trace can be frozen (*VIEW*) or faded out (*BLANK*). If only one window is displayed, the symbol table is assigned to trace 1 and the error table to trace 2.

Submenu: *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULT*



The *SYMB TABLE / ERRORS* soft key displays a table of demodulated bits and a table of modulation errors of the measured signal.

The symbol table shows the demodulated bits of the signal. The number of bits is defined under *RESULT LENGTH* in the same menu. Bits can be related to the traces (in split screen mode) by means of the marker coupling. The marker on the trace and the associated symbol are marked at the same time.
The indicated modulation errors differ depending on whether FSK signals are demodulated or one of the other digital demodulators is active.

The following parameters are indicated as sum errors of the modulation (except with FSK demodulation):

- Frequency error
- Magnitude error
- Phase error
- Error vector magnitude
- I/Q offset
- I/Q imbalance and
- Amplitude droop
- Rho factor.

The FSE evaluates these errors within the result length or in a range limited by the vertical lines within the result length.

With FSK demodulation, the following parameters are indicated as sum errors of the modulation:

- Frequency error
- Magnitude error
- FSK deviation
- FSK deviation error

The entered reference deviation is indicated in addition (*FSK REF DEVIATION*).

Non-FSK demodulations:

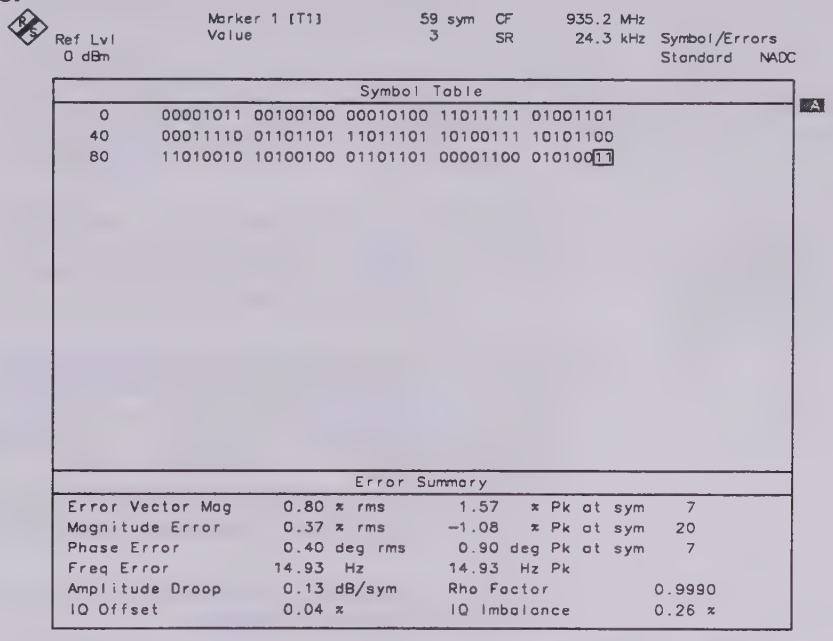

Ref Lvl
0 dBm
Marker 1 [T1]
Value
59 sym
3
CF
SR
935.2 MHz
24.3 kHz
Symbol/Errors
Standard NADC
Symbol Table
0 00001011 00100100 00010100 11011111 01001101
40 00011110 01101101 11011101 10100111 10101100
80 11010010 10100100 01101101 00001100 01010011
Error Summary
Error Vector Mag 0.80 % rms 1.57 % Pk at sym 7
Magnitude Error 0.37 % rms -1.08 % Pk at sym 20
Phase Error 0.40 deg rms 0.90 deg Pk at sym 7
Freq Error 14.93 Hz 14.93 Hz Pk
Amplitude Droop 0.13 dB/sym Rho Factor 0.9990
IQ Offset 0.04 % IQ Imbalance 0.26 %

Fig. 2.4-10 Symbol table and table of sum errors (not FSK demodulation)

Description of errors as follows **(not FSK signals):**

Magnitude error: The magnitude error is the amplitude difference of the I/Q components of measurement signal and reference signal at the points of decision. For MSK modulations, all the points are considered in the calculation. It is a measure for the quality of the amplitude component of the modulated signal.

Phase error: The phase error is the phase difference of the I/Q components of measurement signal and reference signal at the points of decision. For MSK modulations, all the points are considered in the calculation.

Vector error: The error vector magnitude is the magnitude of the error vector which links the measured I and Q value in the complex plane to the ideal I and Q value at the points of decision. The error is calculated according to the following equation:

$$\text{Error vector magnitude (EVM)} = \sqrt{I_{err}^2 + Q_{err}^2}\ , \text{where}$$

I_{err} = error of the inphase signal and
Q_{err} = error of the quadrature signal

Frequency error : The frequency error is the deviation of the FSE center frequency from the measured carrier frequency. It is derived from the frequency shift to be effected for synchronization to the carrier. The reference error of the FSE is also part of the frequency error.

Amplitude droop: The amplitude droop indicates the amplitude variation of the signal between the two symbols at the points of decision in dB. This parameter is very important for TDMA signals and is a measure for the quality of pulse modulation.

I/Q offset: The I/Q offset is a measure for the LO feedthrough with analog I/Q modulators. It can be seen through a shift of the zero point in the constellation diagram. Without LO feedthrough (LO 100 % suppressed), the I/Q offset is zero. It is measured at the points of decision.

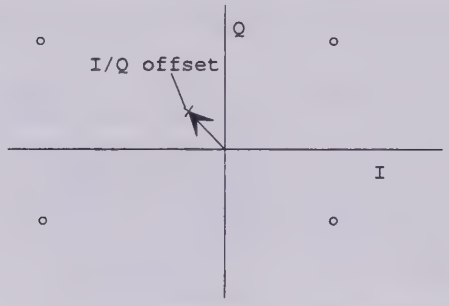


Fig. 2.4-11 Constellation diagram with I/Q offset

Amplitude and vector errors are given in %, phase errors in degrees (deg) or radian (rad). Prior to calculation, the measurement result is normalized in the vector or constellation diagram to a circle around the center of the group mid-points, the radius corresponding to the mean distance of all group mid-points to the center. This circle is defined as a unit circle with the radius 1 (see *NORMALIZE* function in the *MODULATION PARAMETER menu*)
Then, the errors at the points of decision are determined and the rms of the individual error values is calculated. Since the constellation diagram is normalized, the result is the rms value of the error in %.

I/Q imbalance: The I/Q imbalance is a measure for the symmetry of the I/Q modulator to be measured. The I/Q gain error is the result of unequal gain factors in the I and Q path of the transmitter. The I/Q imbalance is calculated from the square root of the quotient of the vector magnitude for the wanted and interfering signals averaged over all points of decision:

$$I/Q\,\text{imbalance} = 100 * \sqrt{\sum_{i=1}^{n} \frac{|\text{Interferencevector}|^2}{|\text{Signal vector}|^2}}\ [\%]$$

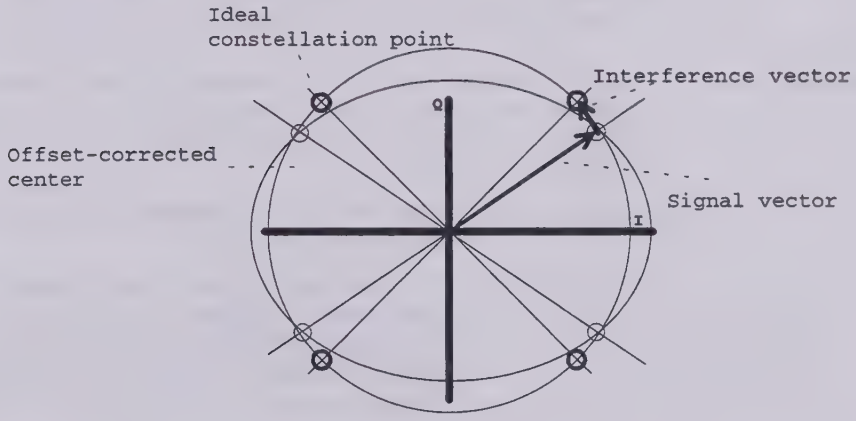


Fig. 2.4-12 Constellation diagram with I/Q imbalance

Rho factor: Similar to the error vector magnitude, the Rho factor is a measure for the quality of digital modulation. It is determined by measurement of the normalized correlated power between the measured signal and reference signal (Qualcomm CDMA to US standard IS-98, Chapter 12.4.2.1) and is designated as waveform quality factor.
The Rho factor can assume a maximum value of 1.0 (measured signal and reference signal are a 100% identical).

FSK demodulation:

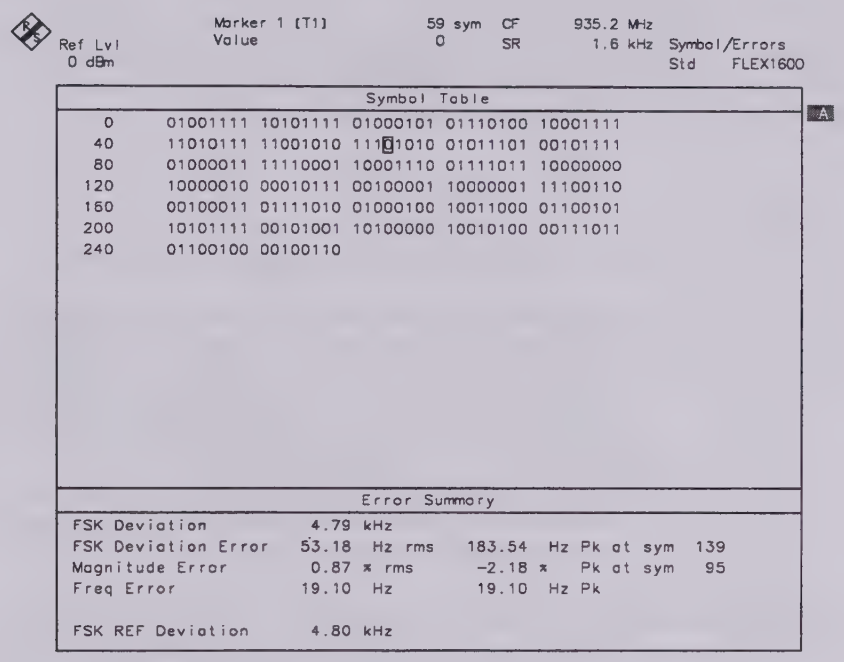


Fig. 2.4-13 Symbol table and table of sum errors (FSK demodulation)

The various errors and measured values have the following meaning (**FSK signals**):

FSK deviation: The FSK deviation is determined by the square difference between measurement and reference signal (formed on the basis of the known demodulated bits and modulation parameters) being minimized. The frequency offset is determined separately and indicated under Freq Error. The frequency error is not considered in the indicated FSK deviation.

FSK deviation error: The FSK deviation error is the deviation difference between the measured signal and the reference signal, measured as an rms and peak value over all symbols. Frequency errors (frequency offset) are part of the indicated FSK deviation error.

Normalize On — The entered FSK reference deviation is used for scaling of the reference signal.

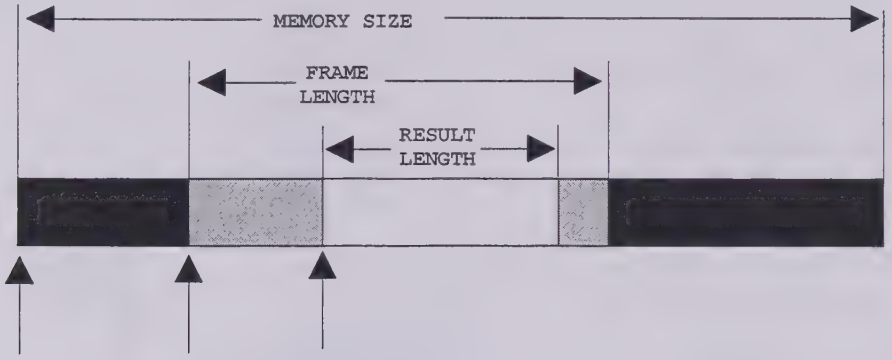
Normalize OFF — The reference signal is automatically derived from the measurement signal on the basis of the known demodulated symbols and modulation parameters so as to ensure maximum agreement between measurement and reference signal.

Magnitude error: With FSK, the magnitude error is the deviation of the individual amplitudes of the AM envelope from the mean (rms) carrier amplitude, measured as an rms value over all symbols displayed and as a peak value normalized to the rms amplitude in %.

Frequency error: The frequency error is the deviation of the FSE center frequency from the measured carrier frequency. It is derived from the frequency shift to be effected for synchronization to the carrier. The reference error of the FSE is also part of the frequency error.

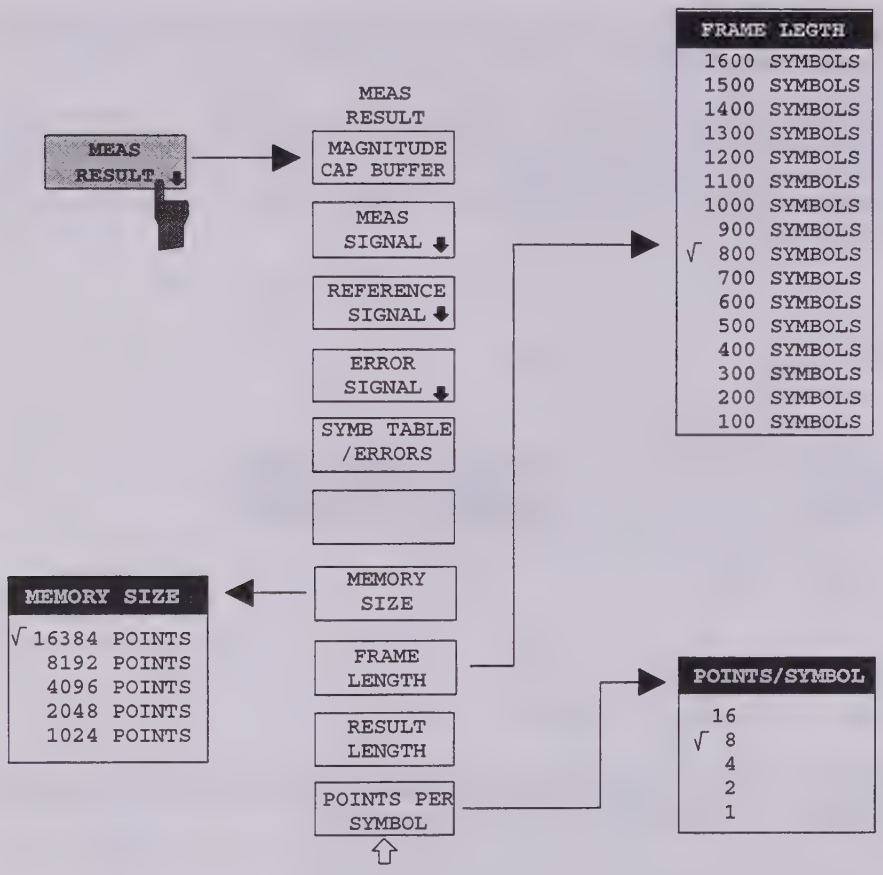
2.4.3.5 Selecting Memory Size, Demodulation Length and Display Range

The size of the capture buffer containing the stored samples, the frame length to be demodulated and displayed and the number of points per symbol can be set to allow an adaptation to the measurement or to optimize the measurement speed.
At the beginning of a measurement, the FSE stores the samples into the capture buffer which can be selected between 1 and 16-k symbols. It then tries to find the suitable frame length for further processing according to the trigger condition (*FIND BURST*). The frame length to be displayed or used for error calculation is defined with *RESULT LENGTH*. It can be positioned within the frame length by synchronization sequence triggering.



Finally, the number of points per symbol can be determined which allows the maximum number of symbols that can be processed in the *FRAME LENGTH* to be determined.

The settings are performed in the *MEAS RESULT* submenu.



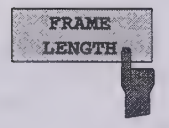
Submenu *CONFIGURATION MODE - VECTOR ANALYZER - MEAS RESULT*

The *MEMORY SIZE* soft key calls up a table in which the number of samples saved in the capture buffer per measurement is determined. Within the memory size a burst, e.g. in the case of a TDMA signal, can be searched for (*FIND BURST* function).

MEMORY SIZE
16384 POINTS
√ 8192 POINTS
4096 POINTS
2048 POINTS
1024 POINTS

Only the symbols entered under *FRAME LENGTH* are used for demodulation.

For symbol rates > 1 MHz the data are stored in the memory without prior filtering and reduction. The maximum memory size is therefore reduced to 4096 points.



The *FRAME LENGTH* soft key calls up a table in which the number of symbols to be demodulated or evaluated is defined.

FRAME LENGTH
1600 SYMBOLS
1500 SYMBOLS
1400 SYMBOLS
1300 SYMBOLS
1200 SYMBOLS
1100 SYMBOLS
1000 SYMBOLS
900 SYMBOLS
√ 800 SYMBOLS
700 SYMBOLS
600 SYMBOLS
500 SYMBOLS
400 SYMBOLS
300 SYMBOLS
200 SYMBOLS
100 SYMBOLS

With up to 4 points per symbol a maximum of 1600 symbols can be demodulated per measurement and their modulation parameters measured. With 8 points per symbol up to 800 symbols, and with 16 points per symbol up to 400 symbols can be handled.

With symbol rates >1 MHz to ≤1.28 MHz a maximum of 600 symbols can be handled. This is due to the fact that the data are stored in the memory without prior reduction. The subsequent reduction limits the FRAME LENGTH in the specified frequency range.

The frame length markedly influences the time required for evaluating a measurement signal. It is therefore recommended to choose the frame length as short as possible. 400 symbols, for example, are sufficient for determining the phase error of a GSM burst as only 147 symbols are to be evaluated. The FSE automatically searches for the correct time domain by trigger functions *FIND BURST* and *FIND SYNC* .

The choice of the frame length influences the maximum number of points per symbol. With up to 400 symbols a maximum of 16 points, with >400 up to 800 symbols a maximum of 8 points and with >800 symbols a maximum of 4 points per symbol is possible.

With symbol rates >1MHz to ≤1.28 MHz, the maximum number of symbols is 600!

The *RESULT LENGTH* soft key opens a window for defining the number of symbols for display on the screen.

The maximum result length is identical to the frame length.

With the *FIND SYNC* function activated (synchronization to bit sequences in the signal), the maximum result length can be reduced (or the frame length increased).

The *POINTS PER SYMBOL* soft key opens a window for entering the number of points per symbol.

1, 2, 4, 8 and 16 points per symbol can be selected. With one point per symbol, each point in the display corresponds to a symbol sampled at the time of decision. With n points per symbol, each n-th value is a point of decision. With 1 and 2 points per symbol, the FSE demodulates with 4 points per symbol for reasons of accuracy. Only one or two samples are output, however.
For up to 4 points per symbol, a frame length of max. 1600 symbols is possible, with 8 points per symbol a frame length of max. 800 symbols and with 16 points per symbol of max. 400 symbols.

In the case of MSK demodulation, the number of points per symbol influences the result of the error measurement as all the points are considered in the calculation. With all other demodulators, only the values measured at the points of decision are taken into account. For GSM, DCS1800 and PCS1900, less than 4 points per symbol should not be used.

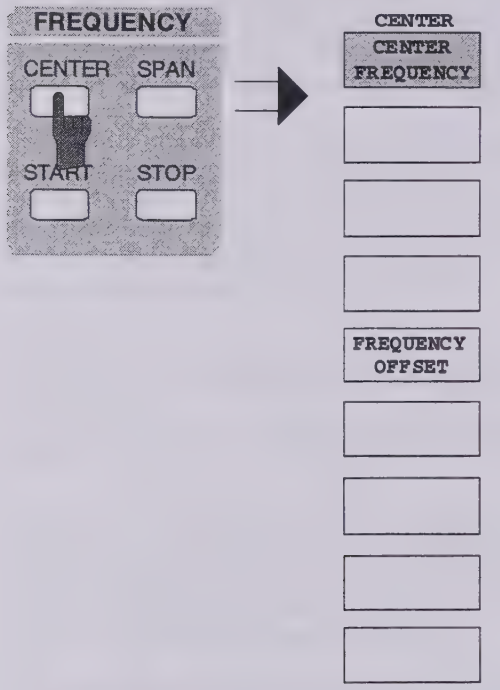
The number of points per symbol largely influences the measurement speed attained during the evaluation of the signal. If high measurement rates are to be attained for automatic tests, for example, a low number of points per symbol is recommended.

2.4.4 Frequency Settings- FREQUENCY Key Group

In vector signal analysis, FSE is always set to a fixed frequency. The RF signal is analyzed by converting the signal into the complex baseband.

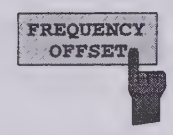
The frequency of FSE is set in the same way as in the spectrum analysis mode, i.e. with the *CENTER* key in the *FREQUENCY* key group.

FREQUENCY CENTER menu



The *CENTER* key calls up the entry window for the center frequency. The frequency may be entered numerically or varied by means of the cursor keys or the rollkey.

For the demodulation of digitally modulated signals, the FSE frequency has to be accurately set to the frequency (carrier) of the signal to be measured so that synchronization to the carrier is possible. The required setting accuracy depends on the symbol rate and must not exceed 2% of the symbol rate.



The *FREQUENCY OFFSET* soft key activates the input of a frequency offset which can be added to the frequency-axis labeling. The displayed frequency is shifted by the frequency offset. The range of values for the offset is 0 Hz to 100 GHz.

2.4.5 Setting the Frequency Span - START, STOP, and SPAN Key

The *SPAN*, *START* and *STOP* keys are not assigned in vector signal analysis for the demodulation of digitally modulated signals since FSE is always set to a fixed frequency and the measurement results are displayed in the time domain. The analysis bandwidth by which the demodulation is performed is predefined by the symbol rate and the number of sampling points.

2.4.6 Setting the Level Display and Configuring the RF Input

2.4.6.1 Setting the Reference Level

With spectrum analysis (ANALYZER mode) of the FSE, the level applied to the RF input is always indicated on the display so that one can see the relationship between the setting of the reference level and the measurement results on the display.

With vector signal analysis, this only applies to operating mode *DIGITAL DEMODULATION, MAG CAP BUFFER* In operating mode *DIGITAL DEMODULATION* with activated demodulation , e.g. when the demodulated signal is displayed this relationship is not obvious. That is why a strict distinction has to be made between setting the **reference value** which is an important reference point for the measured-value display and the **reference level** relating to the RF input.

To obtain a maximum dynamic range it is important for the signal level at the A/D converter to be close to the maximum level of the converter. The maximum level of the converter corresponds to the reference level (*REF LEVEL*) in the spectrum analysis mode. This means that a signal whose amplitude attains the reference level in the spectrum analysis mode is ideal for the vector analyzer mode. An important factor is the **sum level** within the IF bandwidth (=*ANALOG BANDWIDTH* in vector signal analysis mode) of the analyzer.

The reference level can be manually set by checking the signal level in the spectrum analysis mode against the set frequency (at the same IF bandwidth!) and by operating the vector analyzer with the same setting.
The FSE can perform this in vector signal analysis but also by a single automatic setting of the reference level.

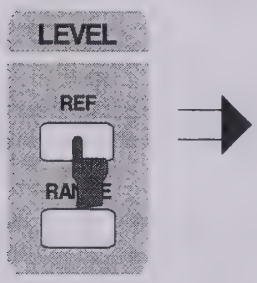
Certain settings of the spectrum analysis mode such as center frequency, reference level and attenuation are taken over by the vector signal analysis. Parameters that are not affected are span (in vector signal analysis, the frequency span has a different meaning: it corresponds to the analysis bandwidth and is thus independent in the two operating modes), resolution bandwidth, ref. level offset as well as trace and trigger settings

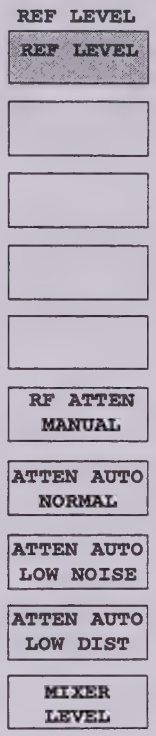
The **reference value** (*REF VALUE*) of the vector signal analysis is the reference point for scaling the measured value. Apart from *DIGITAL DEMODULATION-RESULT DISPLAY-MAGNITUDE CAP BUFFER* it is decoupled from the setting of the reference level, i.e. a direct relationship cannot be determined.

With the ***REF*** key, the **reference level** can be set like in the spectrum analysis mode.

The ***RANGE*** key calls up a menu comprising all the settings required for scaling the measured value such as auto scaling (*AUTO SCALE*), scaling (Y per Div), reference values in the X and Y direction (X/Y_REF VALUE) and the relative position of the reference value on the diagram (*REF VALUE POSITION*).

LEVEL REF Menu





The REF key calls up the menu for setting the reference level and at the same time activates the level entry field.

Operation and soft key functions identical to analyzer mode:

RF ATTEN MANUAL
ATTEN AUTO NORMAL
ATTEN AUTO LOW NOISE
ATTEN AUTO LOW DIST
MIXER LEVEL

The *REF LEVEL* soft key activates entry of the manual gain of the FSE. For a maximum dynamic range, it has to be ensured that the A/D converter is driven to its full range but not overdriven.

In the vector analyzer mode, this is indicated by the messages *IF OVLD* (overload) and *UNLD* (underrange) which inform on the dynamic range when measured data are read in.
When *IF OVLD* is displayed, the instrument or the A/D converter is overdriven during data read-in and entered data are invalid.
With *UNLD* displayed, the A/D converter is not sufficiently driven during data read-in (level <-6 dB of full range). Indicated values may have a reduced dynamic range, i.e. have a greater error.

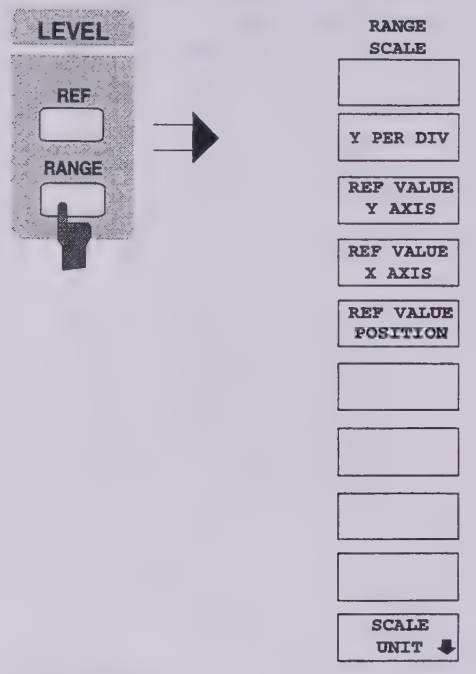
For a correct level setting in the case of *IF OVLD*, reduce the REF LEVEL (continuous sweep mode) in sufficiently small steps (e.g. 2 dB) until the message disappears.
Proceed analogously for increasing the REF LEVEL when *UNLD* is displayed until the message disappears.
The maximum dynamic range is attained approx. 1 dB below the *OVLD* level.

The reference level can also be set to the test signal in the spectrum analysis mode at the same IF bandwidth as in the vector signal analysis mode (with *COUPLED: ANALOG BW AUTO* also 10 kHz) and vector signal analysis can then be selected again.

2.4.6.2 Setting the Display Range and Scaling - RANGE Key

The menu for setting the display range is different from that of the spectrum analysis mode.

LEVEL RANGE menu



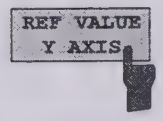
The *RANGE* key calls up a menu comprising all the important display parameters such as reference value, scaling etc.

The Y PER DIV soft key allows the entry of the vertical scaling in the current unit.

For vector or constellation diagrams, the corresponding X scaling is linked with Y scaling:

X PER DIV =5/4 *(Y PER DIV)

Reason: The diagram has 400 x 500 points. In case of a free X scaling circles would be reproduced as ellipses.



The *REF VALUE Y AXIS* and *REF VALUE X AXIS* soft keys call for the entry of the reference value for the Y or X axis of the measurement diagram. The *REF VALUE X AXIS* soft key is only displayed if a polar diagram has been selected for the trace.

The reference value is entered in the corresponding unit of the diagram (See *UNIT*).

Example 1: Constellation diagram: y reference value: +1.20; x reference value: - 0,35
(reference position: 50%)

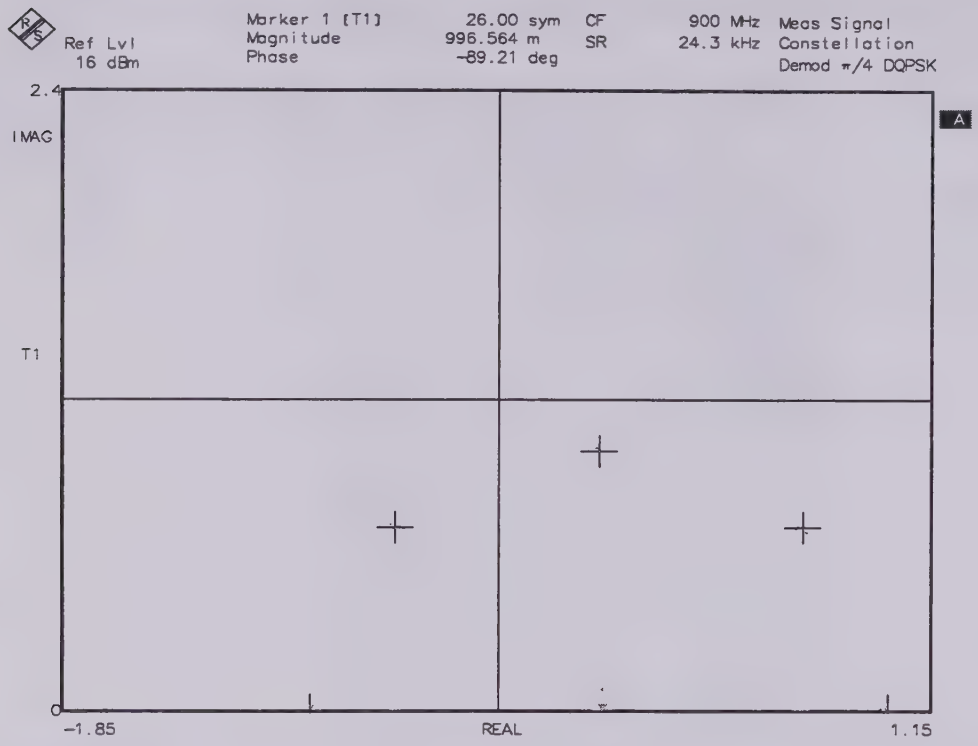


Figure 2.4-12 Representation of the reference values in the constellation diagram

Example 2: Display of I and Q signals:
Y reference value: -0.2
REF position: 50%

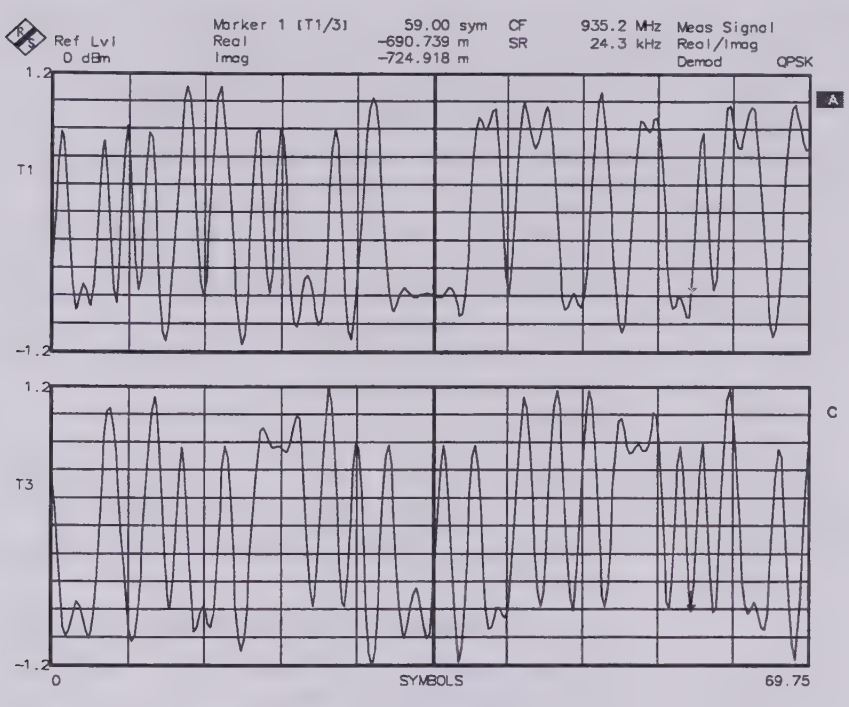


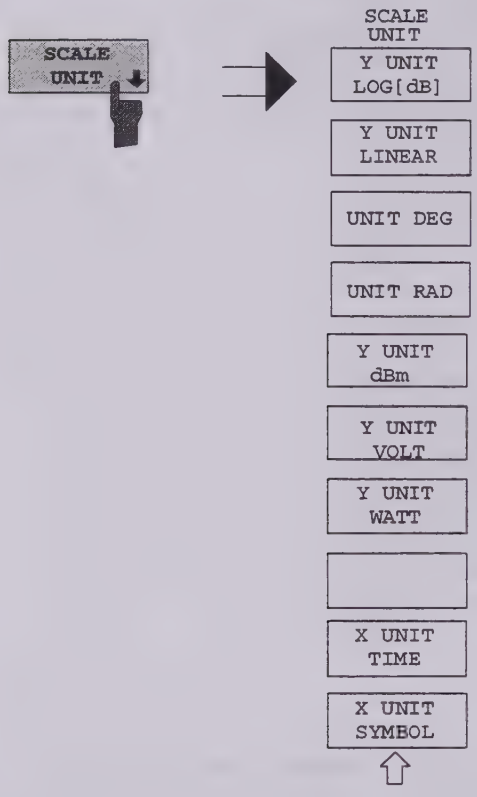
Figure 2.4-13 Display of I and Q signals

The *REF VALUE POSITION* soft key opens a window for setting the reference positions diverging from the basic setting.

REF VALUE POSITION defines the position of the reference value. It normally lies at 100%, i.e. the maximum displayable Y value is also the reference value. It is best to use this setting for displaying the magnitude which is then the basic setting.

When, for example, the timing of I/Q signals or the phase spectrum is displayed it might be desirable to set the reference value to the center. The basic setting is thus 50% (also for polar diagrams).

Submenu: *LEVEL RANGE*



The *SCALE UNIT* soft key calls up a submenu in which the unit of the Y axis and the X axis are set.

The units offered depend on the setting of *RESULT DISPLAY* and *MEAS RESULT*.

For *DIGITAL DEMODULATION*, the logarithmic unit dB (*Y UNIT [dB]*) or dimensionless linear units (*Y UNIT LINEAR*) are permissible for the Y axis.

For error display *MAGNITUDE* and *ERROR MAGNITUDE* and *MEAS RESULT MEAS/REF SIGNAL MAGNITUDE* the unit for

Y UNIT[dB] is dB and for

Y UNIT LINEAR is %.

Errors of *REAL/IMAG PART* are always displayed in %.

Phase errors are displayed in DEG or RAD, frequency errors in Hz.

Only for MEAS RESULT: MAGNITUDE CAP BUFFER:

Possible display units: YUNIT LOG [dB], YUNIT LINEAR, **dBm , Volt and Watt**.

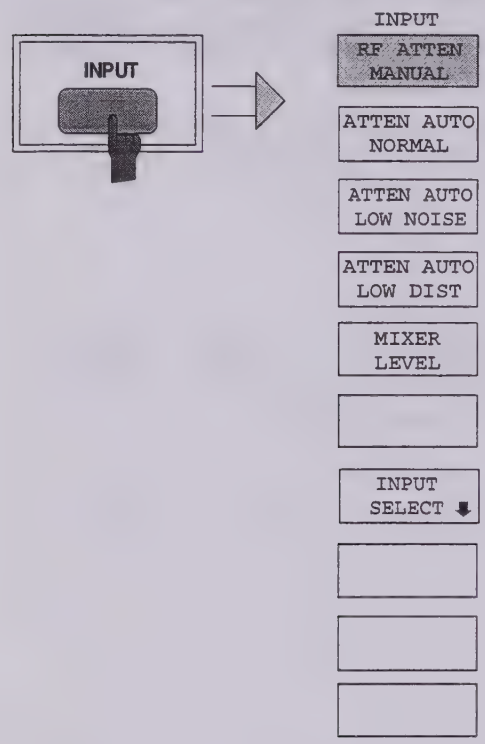
Units that are not permitted in the current operating mode cannot be used.

Table 2.4-3 Allocation table of selectable units or, in case of error display, of the displayed units in operating mode *DIGITAL DEMODULATION* depending on *RESULT DISPLAY* and *MEAS RESULT*

RESULT DISPLAY / MEAS RESULT	MAGNITUDE CAP BUFFER	MAGNI-TUDE	PHASE	FREQUENCY [with FSK and MSK only]	REAL/ IMAG PART	EYE DIAG	POLAR [IQ] VECTOR	POLAR [IQ] CONSTELL
MEAS SIGNAL	Y_UNIT LINEAR Y-UNIT LOG[dB] dBm VOLT WATT	Y_UNIT LINEAR Y-UNIT LOG[dB]	PHASE DEG/ RAD	Hz	Y_UNIT LINEAR	Y_UNIT LINEAR	Y_UNIT LINEAR	Y_UNIT LINEAR
REFERENCE SIGNAL	--	like MEAS SIGNAL	like MEAS SIGNAL	like MEAS SIGNAL	like MEAS SIGNAL	like MEAS SIGNAL	like MEAS SIGNAL	like MEAS SIGNAL
ERROR SIGNAL	--	[%] [dB]	PHASE DEG/RA D	Hz	--	-	-	-
VECTOR ERROR	--	[%] [dB]	DEG/ RAD	--	[%]	-	[%]	[%]

2.4.6.3 Configuration of RF Input in Vector Signal Analysis

This section is identical to that of the spectrum analysis mode (see FSE manual).



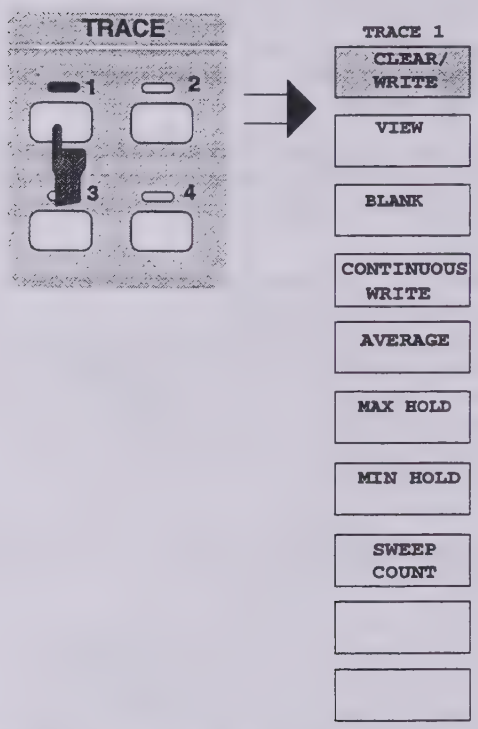
The INPUT key calls up a menu for configuring the RF Input.

Note: *The operating mode recommended for the vector analyzer input is ATTEN AUTO NORMAL. If ATTEN AUTO LOW NOISE is set (or for MIXER LEVEL ≥ –30 dB), the higher signal modulation occuring within the IF-bandwidth causes a nonlinear behavior in the IF branch. This leads to increased measurement errors, in particular for modulation types with a non-constant level (e.g. PSK).*

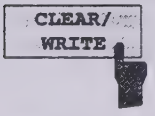
2.4.7 Selection and Setting of Traces - TRACE Key Group

The function of keys TRACE 1 to 4 in vector signal analysis is largely identical with the function in *ANALYZER* mode as long as traces are displayed. If numeric values or tables (e.g. *SYMBOL TABLE*) are displayed, they are also linked with a trace (some of the trace functions are not available then).

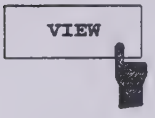
Example: In diagram *SYMB TABLE / ERRORS* the symbol table refers to trace 1 and the error table to trace 2 (not for *SPLIT SCREEN*!) .



The TRACE keys 1 to 4 call up a menu in which the selected trace can be set.

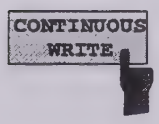


The *CLEAR/WRITE* soft key displays a new trace for each measurement or outputs a measured value. Values from previous measurements are deleted.



The *VIEW* soft key freezes the current contents of the trace memory and displays them. If the device setting is changed, the displayed trace does not change. The measurement data are then invalid with reference to the current setting. This is shown by the enhancement label "*" at the right grid end.

The *BLANK* soft key blanks the trace or the measured values on the display. They are internally stored so that they can be displayed again with the aid of *VIEW*. The markers linked to a trace are also deleted with *BLANK*, but restored after reactivating the trace with *VIEW* or *CLEAR/ WRITE*.



The *CONTINUOUS WRITE* soft key outputs measured values for each sweep or displays a trace without clearing the previous measurements.

This function can be useful for the display of the constellation or eye diagram, where test runs are required for in-depth information.

The *AVERAGE* soft key switches the trace averaging on. The average value is derived from several sweeps.

After switch-on of averaging, the first trace is written in the *Clear/write mode*. Successive averaging is performed from the second sweep.
Averaging is restarted if the *AVERAGE* soft key is pressed. The trace memory is then deleted. This is also the case if the trace memory is set to *VIEW* or *BLANK* in the *AVERAGE* position.

If the *AVERAGE* function is active, the highest values are indicated for peak values (incl. AMPLITUDE DROOP) for the display of the error table. A square averaging is performed for RMS values. For all other displays a linear averaging is performed.

Switch-on of function *AVERAGE* on a trace where the summary markers are active results in a switch-off of summary markers.
On the other hand, summary markers cannot be activated on a trace if one of the *AVERAGE (or MAX HOLD or MIN HOLD)* functions is switched to this trace.
For description of average procedure see 'Traces - TRACE Key Group' in chapter 'Analyzer mode'

Description of the average procedure:

Two different calculation methods are available for averaging. For sweep number = 0, a current average value is calculated according to the following formula:

$$\text{TRACE} = \frac{9 * \text{averraged meas. value} + \text{measuredvalue}}{10}$$

Due to the relative weights between the new measured value and the trace average, the „past" stops providing a sizable contribution to the displayed trace after about 10 sweeps. In this mode, the signal noise is already effectively reduced, although the averaging procedure doesn't have to be restarted if the signal is changed.

For sweep numbers > 1, averaging is performed over the fixed number of sweeps. In this case, the displayed trace is calculated according to the formula:

$$\text{TRACE} = \frac{(n-1) * \text{averaged meas. value} + \text{measuredvalue}}{n},$$

where n denotes the number of the current sweep (n = 2 ... average sweeps). For the first sweep, no averaging is performed, the measured value is directly stored to memory instead. As n increases, the displayed trace is smoothed more and more, because an increasing number of single sweeps becomes available for averaging.

Once the specified number of sweeps has been carried out, the average value is stored to the memory for measured values. Until this number of sweeps is reached, the partial average values are displayed.

For *SINGLE SWEEP,* n single sweeps are triggered on pressing *SWEEP START.* These sweeps are stopped as soon as the selected number of sweeps is reached. The number of the current sweep and the total number of sweeps already performed are shown in the display: *SWP 3 OF 200.*

For *CONTINUOUS SWEEP* the measurement is continued after the maximum number of sweeps has been reached and averaging is continued so that the relative weight of past values is more and more reduced. The display *SWP 200 OF 200* doesn't change until a new measurement is started.

The SWEEP COUNT soft key activates the entry of the number of sweeps required to perform the averaging.
The permissible range of values for the Sweep Count is 0 to 32767. In case of 0, the **FSE** carries out a running averaging over 10 sweeps in the Average mode. No averaging is performed in case of 1.

The default setting is 10 sweeps (Sweep Count = 0). Programming of course influences the sweep duration. The number of sweeps required for averaging or the average time are identical for all 4 traces.

Note: *This sweep number setting in the trace menu is equivalent to that of the sweep menu. If both averaging or hold functions of the summary markers and trace averaging (or MAX HOLD or MIN HOLD) are active on different traces, the SWEEP COUNT counter simultaneously refers to summary markers and trace averaging.*

The *MAX HOLD* soft key activates peak-value averaging.
For every sweep run, the **FSE** identifies the highest value and compares it with the current value. The highest of the two values is then stored in the updated trace memory. Thus, the maximum value of a signal can be evaluated over several test runs.

The trace memory is deleted by pressing the *MAX HOLD* soft key again. Peak-value averaging is started again.

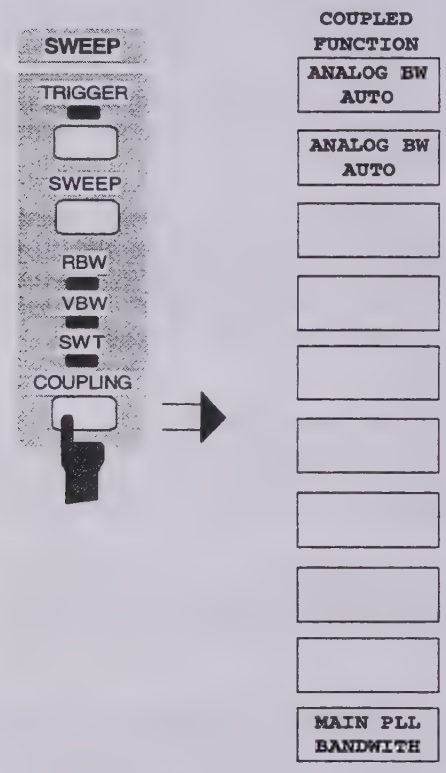
The *MIN HOLD* soft key activates minimum-value averaging. For every sweep run, the **FSE** identifies the smallest of the two values and compares it with the current value. The smallest of the two values is then stored in the updated trace memory. Thus, the minimum value of a signal can be evaluated over several test runs.

The trace memory is deleted by pressing the *MIN HOLD* soft key again. Minimum averaging is stared again.

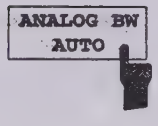
2.4.8 Setting the Analog Bandwidth – SWEEP Key Group

In the vector analysis mode, bandwidth limiting is not at the IF but in the baseband by means of digital filtering. The analog IF filters only serve for attenuating far off signals. The IF filters are set more broadly as required by the signal to be measured in order to increase the measurement accuracy. Thus, the measurement signal is less distorted by the amplitude and phase response of the IF filtering.

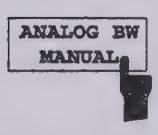
SWEEP COUPLING menu



The COUPLING key calls up the menu for setting the analog bandwidth.



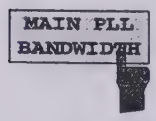
The *ANALOG BW AUTO*, the **FSE** automatically sets the resolution bandwidth to the maximum 10-MHz bandwidth for digitally modulated signals.



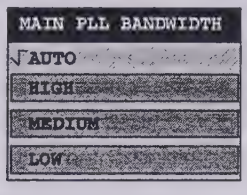
The *ANALOG BW MANUAL* soft key opens a window for entering the bandwidth for the analog prefiltering.

With *ANALOG BW MANUAL*, the **FSE** can be manually set. When the demodulators are used for digitally modulated signals, the minimum analog bandwidth corresponds to the set symbol rate. Since modulation errors increase when narrow analog bandwidths are selected because of the amplitude and phase distortions, UNCAL is displayed for analog bandwidths below 10 times the symbol rate.

Bandwidths below 1 kHz cannot be set as the smallest bandwidth implemented by analog filtering is 1 kHz. When a smaller bandwidth than permitted is set, the **FSE** signals: *RBW out of range*



The *MAIN PLL BANDWIDTH* soft key opens an entry window for setting the main PLL bandwidth.



The main PLL bandwidth is used to synchronize the first local oscillator. The main bandwidth determines the characteristic of the phase noise. A medium and high bandwidth improves the phase noise in a frequency range of 10 kHz around the carrier. A low bandwidth improves the phase noise at distances larger than 100 kHz from the carrier. A main PLL bandwidth which is not appropriately set will impair the phase noise.

In the AUTO mode, the PLL bandwidth is set as a function of the resolution bandwidth and the span according to the following tables:

Models 20 without option B4:

MAIN PLL BANDWIDTH	SPAN ≤ 50 kHz and RBW < 1kHz	SPAN > 50 kHz or RBW ≥ 1kHz
HIGH		
MEDIUM	X	
LOW		X

Models 30 or Models 20 with option B4:

MAIN PLL BANDWIDTH	SPAN ≤ 100 kHz and RBW < 3kHz	SPAN > 100 kHz or RBW ≥ 3kHz
HIGH	X	
MEDIUM		X
LOW		

The settings are chosen such that the phase noise is minimized for small spans, with a small resolution bandwidth and close to the carrier.

If the measurement is performed with a small span but relatively far away from the carrier (distance > 100 kHz), the automatic bandwidth setting causes a phase noise which is not optimal. In this case, the soft key *MAIN PLL BANDWIDTH* can be used to switch the automatic bandwidth setting off. The optimal settings are listed below as a function of the carrier distance @:

Models 20 without option FSE-B4:

MAIN PLL BANDWIDTH	@ ≤ 10 kHz	@ > 10 kHz
HIGH		
MEDIUM	X	
LOW		X

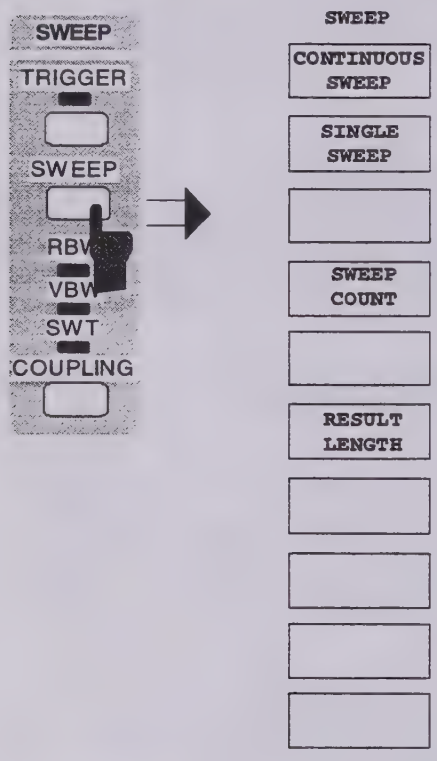
Models 30 or models 20 with option FSE-B4:

MAIN PLL BANDWIDTH	@ ≤ 10 kHz	10 kHz < @ < 100 kHz	@ ≥ 100 kHz
HIGH	X		
MEDIUM		X	
LOW			X

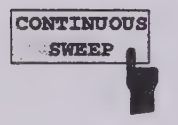
If the sweep time requires a larger main PLL bandwidth, the processor will automatically increase the main bandwidth as much as needed.

2.4.9 Sweep Setup - SWEEP Key

Menu SWEEP SWEEP



The *SWEEP* key calls up a menu in which the type of measurement - single or continuous measurement - and the measurement result length to be displayed in time or symbols are defined.

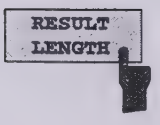


The *CONTINUOUS SWEEP* soft key starts a continuous measurement after defining the trigger condition and selected measurement settings. Following triggering, the measured values will be collected and then evaluated and displayed.
If, for split screen display, measurements in both windows are in the vector analysis mode, data in the measurement RAM are used for the two evaluations.

The *SINGLE SWEEP* soft key starts n measurements with the given trigger settings. The number of sweeps n is determined with *SWEEP COUNT*. The measurement is stopped after n measurements. It can be restarted by pressing *SINGLE SWEEP* again or by *CONTINUOUS SWEEP*.

The *SWEEP COUNT* soft key opens a window for entering the number of measurements for the single sweep.
The number of measurements can be selected between 0 and 32767.
With averaging of measured values set, SWEEP COUNT also determines the number of measurements required for averaging.

SWEEP COUNT = 0	10 measurements are used for a running averaging.
SWEEP COUNT = 1	no averaging is performed.
SWEEP COUNT >1	averaging is performed for the set number of measurements.

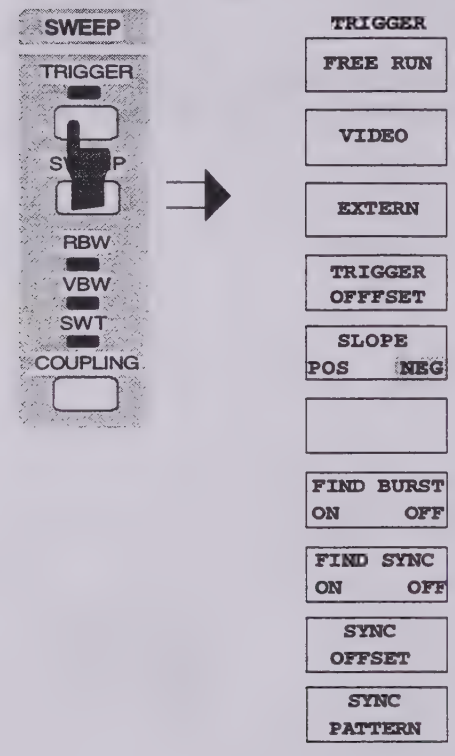


The *RESULT LENGTH* soft key defines the number of symbols or the time slot to be displayed. The maximum number of symbols that can be displayed is equal to the frame length.

2.4.10 Triggering Data Storage - TRIGGER Key

The trigger in the vector analyzer mode determines the time from which data are stored in the result memory. For the demodulation of digitally modulated signals, the time reference can also be obtained by synchronization to a given bit sequence or, for TDMA signals, by searching for a burst in the result memory.

Menu: *SWEEP TRIGGER*



The *TRIGGER* key opens a menu in which the different trigger sources can be set and trigger slopes selected.

The *FREE RUN* soft key activates the measurement without trigger. After a measurement, the memory is prepared to store data for a new measurement.

The free-run mode is recommended if a continuously modulated signal is applied to the RF input or, for TDMA signals, the capture time is long enough to enter a full burst into the result memory.

The capture time is influenced by the memory size (max. 16384 points), the set symbol rate as well as the number of points per symbol.

The *VIDEO* soft key starts the measurement by the video voltage of the analog path of the spectrum analyzer. Parallel to the vector signal analyzer, the analog video voltage of the spectrum analyzer is evaluated.

Video triggering calls for the entry of the trigger threshold. It is identical to the trigger threshold of the spectrum analyzer. The entry of the trigger threshold into the data window is numeric in % of the last grid which has been active in the analyzer mode.
To determine a suitable value for the trigger threshold it is possible to switch to the display MAGNITUDE CAP BUFFER or to measure the threshold in the analyzer mode.

The *EXTERN* soft key activates triggering by means of an external voltage between -5 V to +5 V at the rear BNC connector *EXT TRIGGER / GATE*. The desired value is to be entered into the window.

The *TRIGGER OFFSET* soft key opens a window for entering the desired offset.

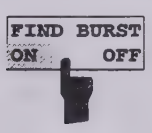
With *TRIGGER OFFSET,* the start time for the data storage relative to the trigger event is determined. Both positive values (for a trigger delay) and negative values (for a pretrigger) are permitted.

Entry is in absolute time independent of the scaling of the X axis.

For positive values of the trigger offset (trigger delay), values from 1 µs to at least 10 ms are permitted, depending on the symbol rate and the number of points per symbol. The range of values for negative trigger offsets (pretrigger) depends on the selected memory size and is not more than half the memory size.

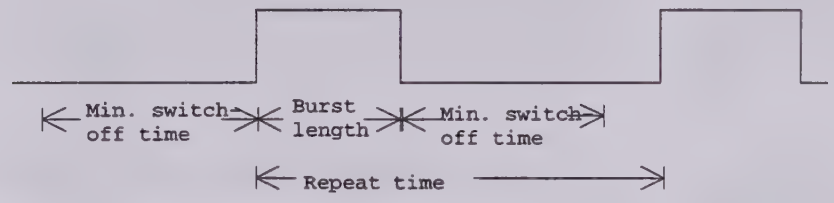
The *SLOPE POS/NEG* soft key determines the trigger slope in case of triggering by means of the video signal or external trigger.

The sweep starts after a positive or negative slope of the trigger signal. With a free-running trigger the setting is irrelevant.



The *FIND BURST ON/OFF* soft key searches for a burst in the stored data (within the entered memory size), demodulates it within the entered frame length and displays it with the set result length.
The *FIND BURST* mode is particularly useful for TDMA signals if a burst is to be completely displayed (and would otherwise not be demodulated due to the mark-to-space ratio at the maximum setable frame length of 800 symbols). The time required for searching for a burst is determined with memory size.
A burst must have a minimum length of 30 symbols to be identified.

Digital communication systems operating according to the TDMA access methods transmit or receive information in the form of bursts. The carrier power is only switched on for a certain time. The transmitter switches the carrier on if an information is to be transmitted and switches it off again.



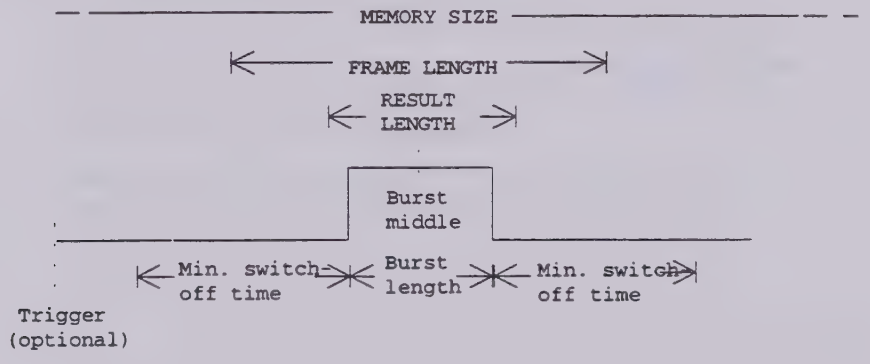
The carrier power is switched off between two bursts. With *FIND BURST,* the **FSE** searches for a complete burst, i.e. for a carrier that can be switched on ***and*** off. If no complete burst is found within the search time, the message *BURST NOT FOUND* is displayed.

If a trigger (video or extern) is used for the storage of the measured values, a negative trigger offset (pretrigger) is recommended so that a sufficiently long switch-off time of the carrier is available at the beginning of the search time.

The search time has at least to be as long as the burst length plus twice the switch-off time to ensure that the burst is found.

For a free-running trigger, set the length of the captured data *(MEMORY SIZE)* to a minimum (repeat time + 2 x switch-off time + burst length) so that the burst can be found.

The **FSE** centers the number of symbols (*FRAME LENGTH*) required for demodulation as well as the displayed symbols (*RESULT LENGTH*) to the center of the found burst (*FIND SYNC OFF*).

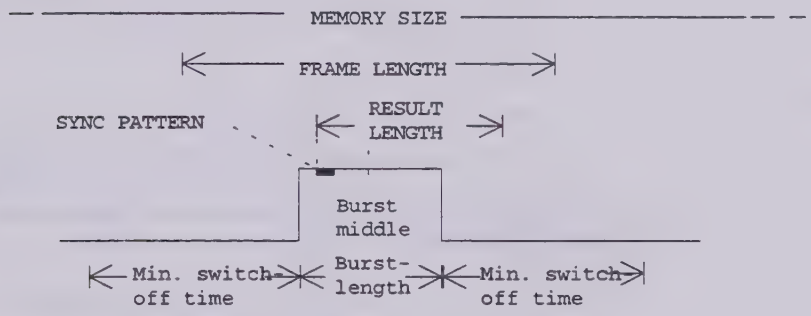


The *FIND SYNC ON,* soft key searches for a defined bit sequence (sync pattern) within the set frame length. The measurement result is displayed with the set result length with reference to the first symbol of the synchronization sequence.

If the synchronization sequence is not found, a result is still output according to the set result length. The message*: SYNC NOT FOUND* is then output.

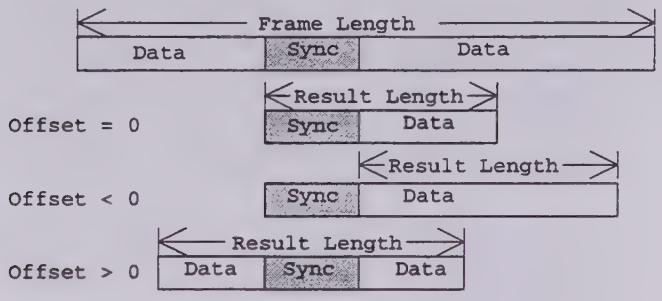
Centering the burst on the middle of the picture cannot be carried out if the burst is found at the very beginning of the data set (of the memory size) and a **Result Length >Burst Length + 2×20 symbols** is set. A precondition for burst recognition is that before the rising edge measured values corresponding to at least 20 symbols are present in the current trace memory. In this case, the burst is represented from the first measured value in the trace memory.
If the consequent centering of the burst is indispensable for the user, the result length has to be reduced according to the above precondition.

In case of *FIND BURST ON* and *FIND SYNC ON,* the **FSE** only centers the frame length to the center of the burst while the result length is displayed from the beginning of the bit sequence (in case of *SYNC OFFSET* 0) or around the *SYNC OFFSET.*



The *SYNC OFFSET* soft key opens a window for entering the offset in symbols.

SYNC OFFSET defines the display time prior to the synchronization sequence in SYNC SEARCH. It thus determines the position of the displayed trace or symbols (result length) within the demodulated signal (frame length). The modulated signal may have a preamble or a midamble. Depending on the configuration it is thus desirable to display the measurement signal from a synchronization sequence or prior to the synchronization sequence.



A positive or a negative offset can be set.

The minimum or maximum offset depends on the following parameters:

- frame length
- result length and
- position of the sync sequence in the burst

Any offset can basically be entered provided that the measurement result is within the frame length. If the frame length is extended, a higher offset can be entered. If the result length is extended, the maximum offset is reduced.
The frame buffer contains the data available for the evaluation (frame length).

The message „SYNC OFFSET INVALID“ indicates that there are not enough data available for displaying result length.

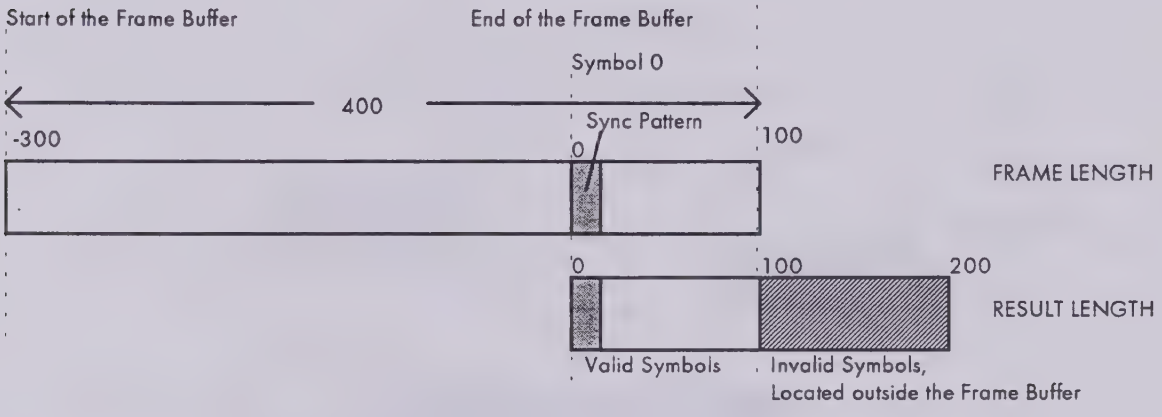
The following examples explain how frame length, sync offset and result length are related.

Example 1 (input signal without burst):

Device settings:

- Input signal (without burst)
- FIND BURST off
- FIND SYNC on
- FRAME LENGTH = 400
- RESULT LENGTH = 200
- SYNC OFFSET = 0

The start of the frame buffer is at symbol -300 (with respect to the sync pattern), the **FSE** displays the results starting with symbol no. 0, but there are no more than 100 valid symbols in the file, 100 symbols of the result length are invalid because they are located outside the frame buffer.



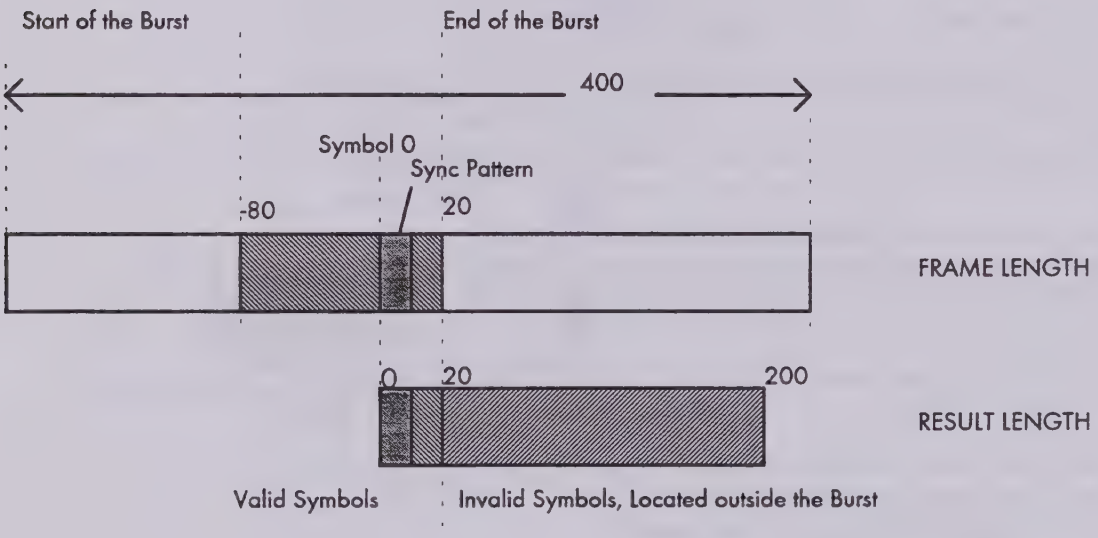
Solution: diminish result length to 100 symbols *or*
extend frame length to 800 symbols.

Example 2 (input signal with burst):

Device settings:

- Input signal (burst length 100 symbols)
- FIND BURST on
- FIND SYNC on
- FRAME LENGTH = 400
- RESULT LENGTH = 200
- SYNC OFFSET = 0

After successful search of the burst, only the symbols inside the burst are marked as valid.
The synchronization pattern is found in the burst (Symbol 0), the **FSE** displays starting with symbol no.0, but there are only 20 valid symbols in the burst, 180 symbols of the result length are invalid because they are located outside the burst.



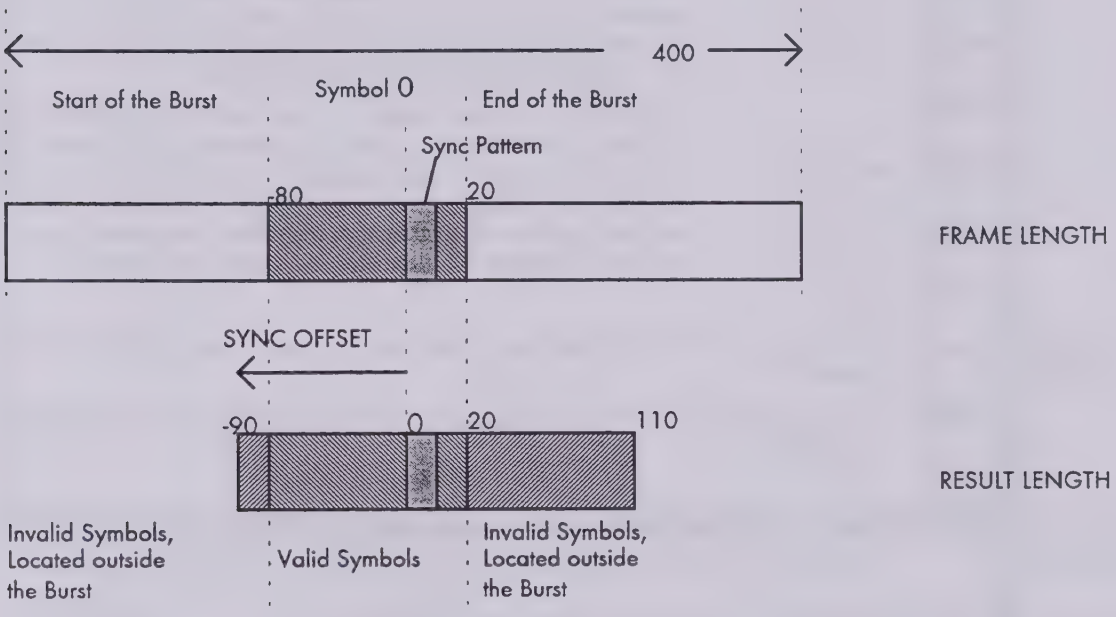
Solution: diminish result length to 20 symbols.

Example 3 (input signal with burst):

Device settings:

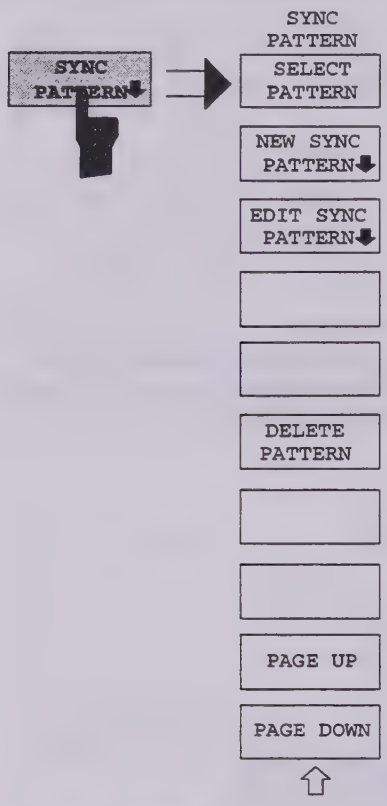
- Input signal (burst length 100 symbols)
- FIND BURST on
- FIND SYNC on
- FRAME LENGTH = 400
- RESULT LENGTH = 200
- SYNC OFFSET = 90

After successful search of the burst, only the symbols inside the burst are marked as valid.
The synchronization pattern is found in the burst (Symbol 0), the **FSE** displays starting with symbol no. -90 up to +19, the beginning of the display range is located before the start of the burst !



Solution: diminish result length to 100 symbols (= burst length)
set sync offset to 80 (beginning of the burst lies 80 symbols before the sync-pattern).

Submenu: *SWEEP TRIGGER*



The *SYNC PATTERN* soft key calls up a submenu, allowing to select available patterns.

These patterns are displayed in the table *PATTERN NAME*. If a pattern is activated, the bit sequence of the selected pattern is displayed in the table PATTERN VALUE.

The synchronization pattern defines a bit sequence which is searched for in the signal to be demodulated. When the *SYNC SEARCH* function is activated, this bit sequence is used for synchronizing measurement results. The **FSE** demodulates the signal to be measured down to bit level and searches for this predefined sequence. The first symbol in the bit sequence is the reference time.

The bit sequence of digitally modulated signals often includes a preamble or midamble which is used on the one hand for assessing the channel impulse response and setting the channel equalizer in the receiver and on the other hand to synchronize the receiver. This bit sequence may be used in the to find and display particular signal sections.

The maximum pattern length of the **FSE** is 30 symbols. The number of bits depends on the significance of the modulation method. With QPSK, for instance, 30 symbols correspond to 60 bits, with 16QAM to 120 bits. The **FSE** always uses an integral multiple of the bits per symbol. Bits which are not multiples or exceed the maximum length are omitted.

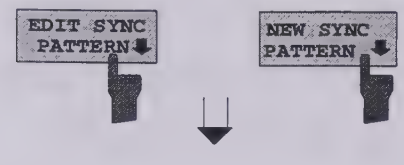
The *SELECT PATTERN* soft key marks the first field in the *PATTERN NAME* table.

The bit sequence of the selected pattern is displayed simultaneously with the PATTERN VALUE table.

The *DELETE PATTERN* soft key clears the pattern marked by the cursor. To avoid the pattern being inadvertently deleted, a confirmation is required..

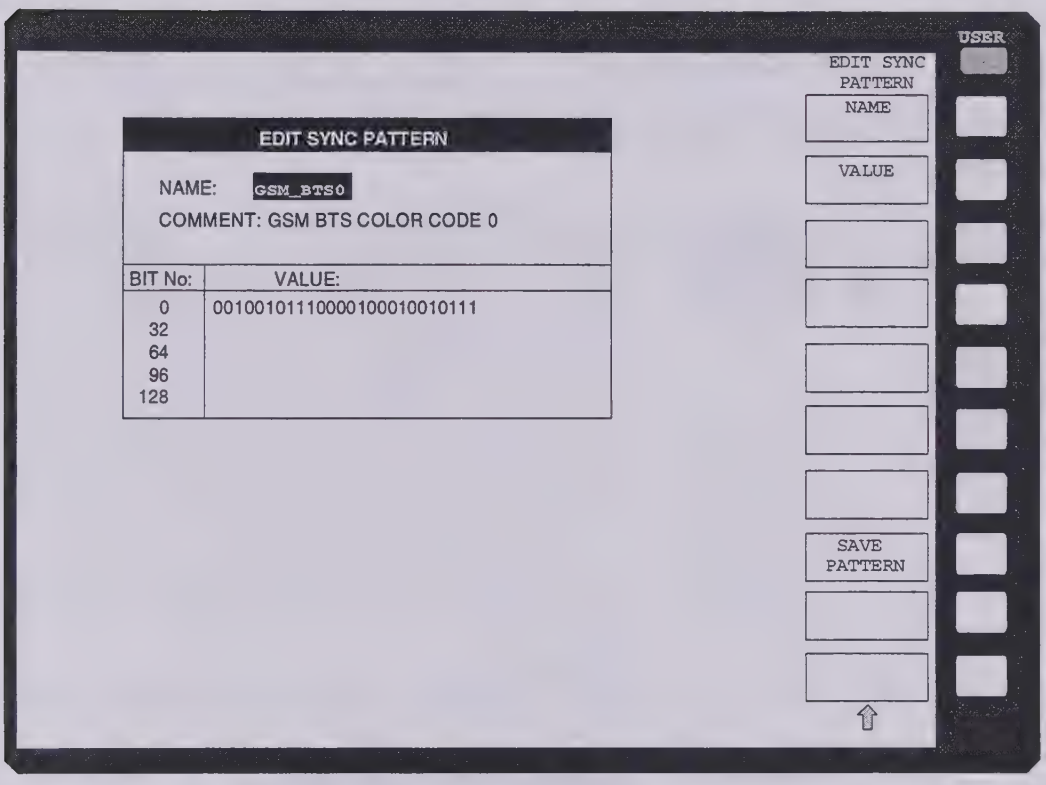
The *PAGE UP/PAGE DOWN* soft key causes the next/last page of the sync pattern table to be displayed.

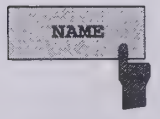
Submenu: *SWEEP TRIGGER - SYNC PATTERN*



The *NEW PATTERN* and *EDIT PATTERN* soft keys call up the *EDIT SYNC PATTERN* submenu for generating limit lines.
In the head line of the table the name and comment of the sync pattern to be edited or modified can be entered.

The sync pattern is entered or modified in the VALUES field.





The *NAME* soft key activates the input of the name of the sync pattern. A maximum of eight characters can be entered.
When the sync pattern is stored, the extension .PAT is automatically appended.

The *COMMENT* soft key activates the input of a comment for the sync pattern.

The *VALUE* soft key activates the input of the bit pattern of the sync pattern.

The *SAVE PATTERN* soft key stores a newly edited pattern under the current name.

2.4.11 MARKER Key Group

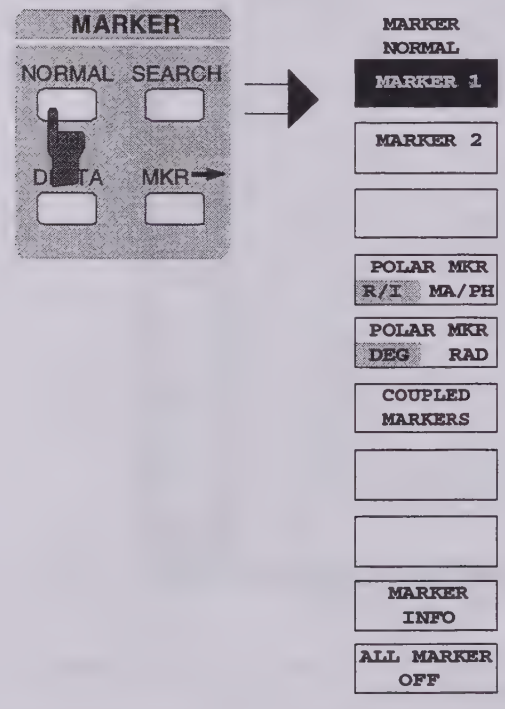
In the vector analyzer mode markers may be used for highlighting points in a trace and for reading out measured values.
For a detailed description of marker operation refer to section 2.9.3 in the FSE operating manual.

In the vector analyzer mode marker soft key functions depend on the selected measurement.

2.4.11.1 Main Marker - NORMAL Key

The main markers and their functions are selected with the *NORMAL* key.

MARKER NORMAL menu



The *NORMAL* key calls up a menu comprising all standard marker functions.

Activated marker functions are indicated by a dark background of the soft keys. If no marker is activated when the *NORMAL* key is pressed, MARKER 1 is activated as a reference and set to the maximum value in the curve. (automatic switch-on of peak search function provided at least one trace is active; not with polar diagram). In all other cases the reference marker is activated but no automatic peak search is performed.

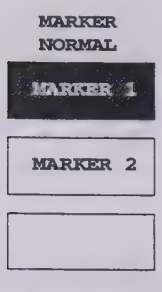
In the marker field the marker position (time), the measured value or values (in the case of a complex display) and the trace relevant for the marker (here [T1]) are displayed.

Example:
Marker display in the digital demodulation and I/Q display mode:

```
Marker 1 [T1/3] 22.3 µs
Real              0.998
Imag             -0.124
```

When the symbol table is displayed (soft key *SYMB TABLE/ERRORS* in submenu *MEAS RESULT*) the marker moves from symbol to symbol in the table. The position of the marker is indicated by a dark background and its numerical value in inverse video.

In the marker field, the marker position and the decimal value of the symbol are displayed.



The *MARKER 1* and *MARKER 2* soft keys switch the respective marker on or off or define it as an entry marker (reference marker).

The *POLAR MARKER R/I / MA/PH* soft key selects magnitude and phase (*MA/PH*) or real and imaginary part (*R/I*) for the numeric result display in the polar diagram.
When measured values are indicated versus time this soft key is disabled.

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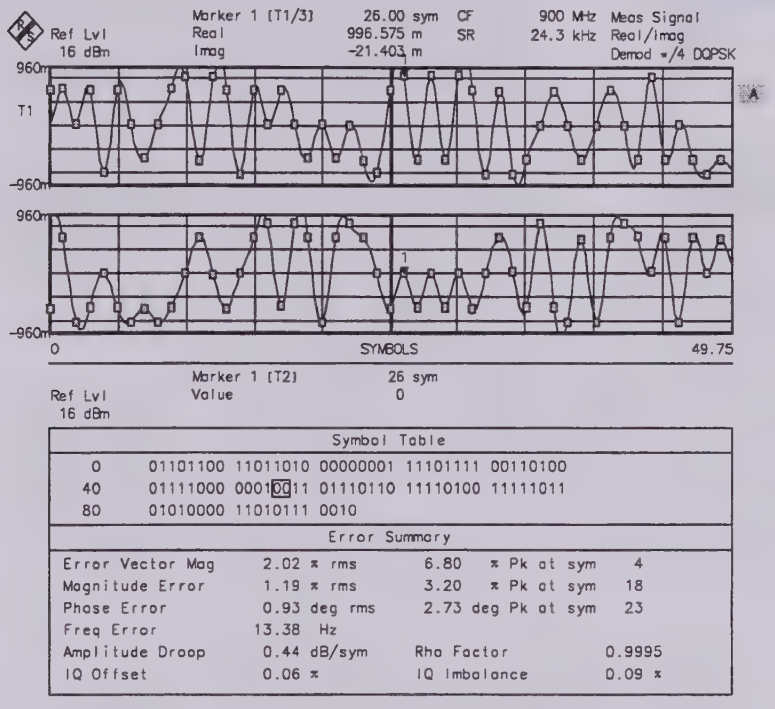
The *POLAR MARKER DEG/RAD* soft key selects the unit degree (*DEG*) or radiant (*RAD*) for indication of the phase of the marker in the respective diagram.

The *COUPLED MARKER* soft key couples markers (and delta markers) of different traces in the combined display mode *REAL/IMAG PAR*. In this case the X position of corresponding markers is identical.
This allows complex marker values to be displayed which correspond to the polar display.

Marker 1 6.75 SYM [T1/3]
RE 0.895
IM 1.002
If several windows are displayed, the markers of **all** windows are coupled when the *COUPLED MARKERS* function is active.


Marker 1 [T1/3] 25.00 sym CF 900 MHz Meas Signal
Ref Lvl Real 996.575 m SR 24.3 kHz Real/Imag
16 dBm Imag -21.403 m Demod π/4 DQPSK
960m
T1
-960m
960m
-960m
0
SYMBOLS
49.75
Marker 1 [T2] 26 sym
Ref Lvl Value 0
16 dBm
Symbol Table
0 01101100 11011010 00000001 11101111 00110100
40 01111000 00010011 01110110 11110100 11111011
80 01010000 11010111 0010
Error Summary
Error Vector Mag 2.02 % rms 6.80 % Pk at sym 4
Magnitude Error 1.19 % rms 3.20 % Pk at sym 18
Phase Error 0.93 deg rms 2.73 deg Pk at sym 23
Freq Error 13.38 Hz
Amplitude Droop 0.44 dB/sym Rho Factor 0.9995
IQ Offset 0.06 % IQ Imbalance 0.09 %

The *ALL MARKER OFF* soft key switches all markers including reference and delta markers off and closes the marker entry window. In addition the *MARKER INFO* soft key is switched off.

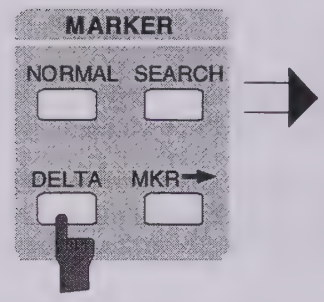
The *MARKER INFO* soft key allows several markers to be displayed in the grid, in addition to the display of marker information in the marker field of the diagram headline.
In the top right-hand corner of the grid the two markers or delta markers are displayed with symbols ∇/Δ, marker number (1, 2), position and measured value (may be complex). The number of symbols for specifying the marker position is limited in certain cases.

If there are not enough lines for displaying all active markers and delta markers, the markers are listed first and then the delta markers.

In the *SPLIT SCREEN* display this list is divided into two lists, one for *SCREEN A* and one for *SCREEN B*.

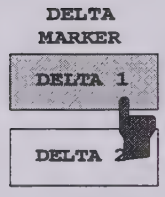
2.4.11.2 Delta Marker - DELTA Key

MARKER DELTA menu



The *DELTA* key in the MARKER key group selects the delta markers.

Delta markers are always referenced to the active reference marker . When no marker is active, switching on a delta marker automatically activates marker 1. Delta markers are displayed as an unfilled symbol ▽. When the delta marker is active for entry, a filled symbol ▼ is displayed.



The *DELTA 1* and *DELTA 2* soft keys switch on delta markers 1 and 2.

Operation of delta markers is identical to that of markers. When a delta marker is switched on, all entries apply to the delta marker. For changing the position of the main marker, the main marker has to be reactivated. Displayed differences normally apply to the active reference marker.

In the delta marker field, the number of the delta marker, the time difference to the reference marker and the difference of measured values between the active delta marker and reference marker are displayed.

The *DELTA ABS / REL* soft key switches between absolute (*ABS*) and relative (*REL*) input of time of the delta marker.

Default setting is *REL* (input relative to the reference marker)

The *ALL DELTA OFF* soft key switches off all active delta markers and any associated functions.

2.4.11.3 Search Functions (Marker Search menu) - SEARCH Key

The menus called up with *SEARCH* offer functions for a peak/min search and universal marker functions for overall evaluation of traces. The search functions can be used for markers and delta markers.

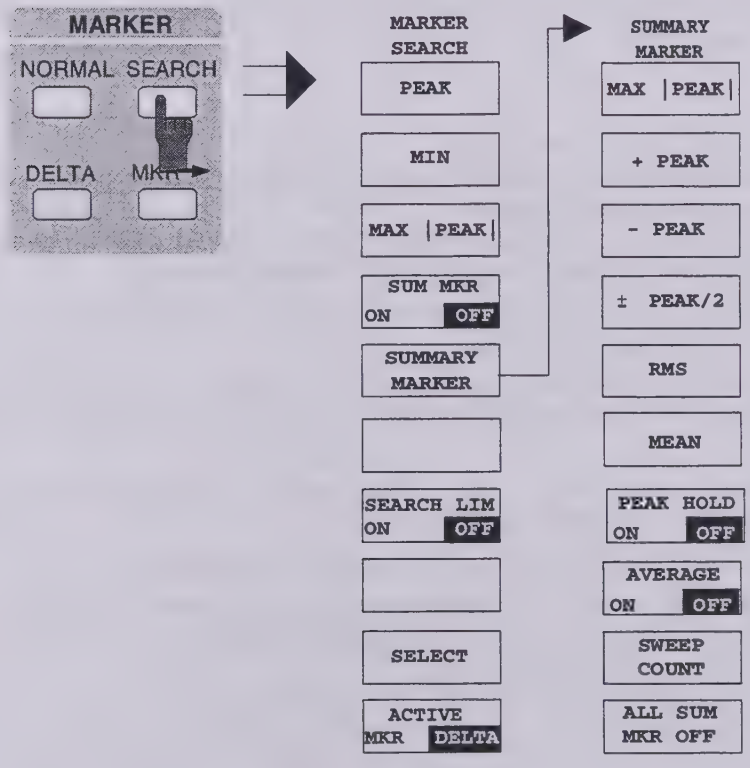
Important: With polar diagrams, peak/min. peak values refer to the vector length (with origin as reference), in all other cases to the Y deflection. In this diagram, summary markers cannot be switched on or are not displayed.

Functions in the *MARKER SEARCH* menu refer to the marker or delta marker active during entry. Switchover between the active marker and delta marker is possible with the *ACTIVE MKR DELTA* soft key.

If no marker is switched on when the *SEARCH* key is pressed, marker 1 is activated as reference marker (by means of peak search).

The search range can be limited by time lines (*TIME LINE 1/2*) switched on with *SEARCH LIM ON/OFF*. The limitation of the search range is valid for all the marker search functions including the SUMMARY MARKERS and for error calculation during *SYMB TABLE/ERRORS*.
The time lines are only visible for diagrams versus time, i.e. not for polar diagrams and for diagrams of *SYMB TABLE/ERRORS*. The limitation of the search range is valid for *SEARCH LIMITS ON* for all diagrams irrespective of whether the time lines are visible or not.

MARKER SEARCH menu



The *ACTIVE MKR / DELTA* soft key switches over between active marker and active delta marker.

With *DELTA* highlighted, subsequent search functions are carried out with the active delta marker.

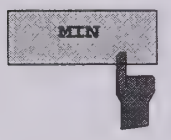
Note: *Switchover between marker and delta marker entry is also possible with the NORMAL and DELTA keys.*

The *SELECT MARKER* soft key opens the table for selection of the marker or delta marker.

The *MAX |PEAK|* soft key sets the active marker or delta marker to the highest magnitude displayed (*PEAK* or *MIN*) in the associated curve.

For instance, the function searches for the maximum phase error of a signal, which may be positive or negative.

The *PEAK* soft key sets the active marker or delta marker to the highest value displayed in the associated measured curve.



The *MIN* soft key sets the reference marker to the lowest value in the associated curve.

The *SEARCH LIMIT ON/OFF* switches between limited (ON) and unlimited (OFF) search range.
The search range can be limited by time lines (*TIME LINE1/2)* for peak- and min-search functions as well as for the summary markers.

If *SEARCH LIMIT* is *ON*, a search for the corresponding signals is only performed between the two lines.

If only one line is switched on, *TIME LINE 1* is valid as lower limit (the upper limit is the stop frequency), *TIME LINE 2* defines the upper limit value.

If no line is active, lines 1 and 2 are switched on automatically and positioned to 20 % and 80 % of the grid.

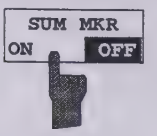
If the function is switched off, the lines continue to be switched on.

Time lines are not visible for polar diagrams and for Symb Table/Errors. The limitation of the search range, however, remains effective.

Default value is *SEARCH LIMIT OFF.*

2.4.11.3.1 The Summary Marker

MARKER SEARCH menu



The *SUM MKR* soft key switches the display of the summary marker values in the marker info field on and off. The measured values are updated after every sweep end (in case of AVG/*HOLD OFF).*

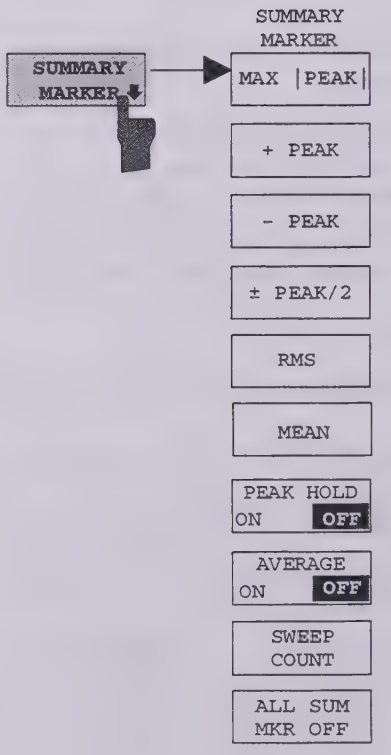
If one trace is in *AVERAGE*, *MAX HOLD* or *MIN HOLD* mode, the summary markers for this trace cannot be switched on.

On the other hand, the summary markers are switched off if the trace functions *AVERAGE*, *MAX HOLD* or *MIN HOLD* are activated (only valid for the same trace).

The maximum and average values can be maintained or displayed for all summary markers by means of function *HOLD ON/OFF* or *AVERAGE ON/OFF* if Sweep Count >0.

Example:
Marker info field for :
Summary Marker: + *PEAK* and *MEAN* switched on, *PEAK HOLD ON* and *AVERAGE ON*:

```
▼1              63. sym
 MAGN CAP     2.40 Watt
+PEAK HOLD    2.55 Watt
+PEAK AV      2.39 Watt
 MEAN HOLD    2.33 Watt
 MEAN AV      2.29 Watt
```



The *SUMMARY MARKER* soft key calls up the submenu for selecting the summary marker values to be displayed in the marker info field.

The measured values are updated for every sweep.
(In case of setting *SYMB TABLE/ERRORS* the marker info field is not displayed).

The *MAX |PEAK|* soft key selects the measurement of the magnitude of the higher of the two peaks *+PEAK* and *-PEAK* per sweep.

The search range can be limited by means of function *SEARCH LIMITS ON*.

With the *PEAK HOLD* function activated, the highest peak value that has occurred since the activation of *PEAK HOLD* is displayed.

With the *AVERAGE* function activated, the highest peak values are averaged and displayed.

The *+PEAK* soft key selects the measurement of the positive peak value per sweep.

The search range can be limited with the function *SEARCH LIMITS ON*.

With the PK Hold function activated, the highest positive peak value that has occurred since the activation of *PEAK HOLD* is displayed.

With the AVERAGE function activated, the positive peak values are averaged and displayed.

The *-PEAK* soft key selects the measurement of the negative peak value per sweep.

The search range can be limited with the function *SEARCH LIMITS ON*.

With the peak hold function switched on, the highest negative peak value that has occurred since the activation of *PEAK HOLD* is displayed.

With the *AVERAGE* function switched on, the highest negative peaks are averaged and displayed.

The *±PEAK* soft key selects the measurement of the average value of the positive and negative peak value per sweep.

The search range can be limited with the *SEARCH LIMITS ON* function.

With the peak hold function switched on, the highest average value that has occurred since the activation of *PEAK HOLD* is displayed.

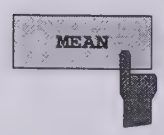
With the AVERAGE function switched on, the average values of the positive and negative peak value (versus time) are averaged and displayed.

The *RMS* soft key selects the measurement of the rms value of the signal per sweep.

The search range can be limited with the *SEARCH LIMITS ON* function.

With the peak hold function switched on, the highest rms value that has occurred since the activation of the *PEAK HOLD* function is displayed.

With the *AVERAGE* function switched on, the rms values are averaged versus time and displayed.



The MEAN soft key selects the measurement of the average value of the signal per sweep. Thus, the average carrier power can be measured during a GSM burst (during display of *MAGNITUDE CAP BUFFER*).

The search range can be limited with the *SEARCH LIMITS ON* function.

With the peak hold function switched on, the highest average value that has occurred since the activation of *PEAK HOLD* is displayed.

With the *AVERAGE* function switched on, the average values (of a trace) are averaged versus time and displayed.

The *PEAK HOLD ON / OFF* soft key switches the peak hold function of the summary markers on or off.

All active summary markers are only updated after every sweep end if higher values have occurred.

The measured values can be reset by switching the *PEAK HOLD ON / OFF* soft key off and on again.

The *AVERAGE ON / OFF* soft key switches the averaging of the summary markers on or off.

The measured values can be reset by switching the *AVERAGE HOLD ON / OFF* soft key off and on again.

The *SWEEP COUNT* soft key activates the entry of the number of measurements (sweeps) in the *SINGLE SWEEP* mode.

The number of measurements can be selected between 0 and 32767.

If an averaging of measured values or the peak hold mode is set, *SWEEP COUNT* also determines the number of measurements required for averaging or maximum averaging.

SWEEP COUNT = 0	10 measured values are always required for a running averaging.
SWEEP COUNT = 1	no averaging is performed.
SWEEP COUNT > 1	averaging is performed over the set number of measured values.

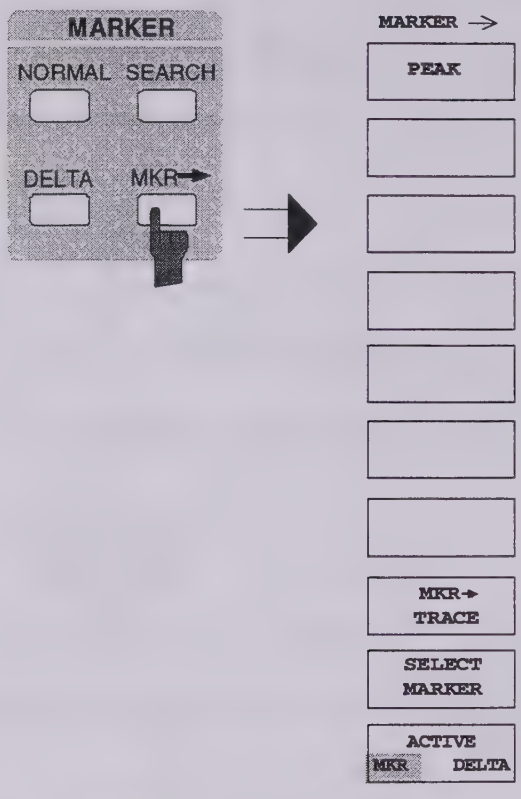
In case of *CONTINOUS SWEEP* the FSE (*AVERAGE ON*) performs an averaging until the number of sweeps set under *SWEEP COUNT* is attained and then performs a running averaging.

Maximum averaging is infinite irrespective of *SWEEP COUNT*.

The *ALL SUM MKR OFF* soft key switches off the summary markers.

2.4.11.4 Varying Instrument Settings by means of Markers - MKR→ Key

MARKER MKR→ menu



The *MKR ->* key calls up a menu which offers functions for varying instrument parameters by means of the currently active marker. Same as in the *SEARCH* menu, the functions are also valid for the delta markers.

The selection of marker or delta marker depends on the currently active frequency entry for marker or delta marker. If no entry is active, the marker with the lowest number is activated as reference marker.

To simplify operation, the *PEAK* search function is also available in the *Marker→* menu.

The *MKR → TRACE* soft key opens a window in which the marker can be positioned on a new trace. Only selectable traces are displayed in the window.

The *SELECT MARKER* soft key opens the table for selection of the marker or delta marker.

The *ACTIVE MKR / DELTA* soft key is used for switchover between active marker and delta marker.

With *DELTA* activated (highlighted), the following marker functions are carried out with the active delta marker.

Note: *Switchover between marker and delta marker entry is also possible by means of the* NORMAL *and* DELTA *keys.*

If no delta marker is active when *DELTA* is selected, delta marker 1 is activated (with peak search).

2.4.12 Setup of Display and Limit Lines – *LINES* Key Field

2.4.12.1 Display Lines – *D LINES Key*

Display lines are aids which, similar to markers, make the evaluation of measurement curve data more convenient. The function of display lines is similar to that of a movable scale which can be used to measure absolute and differential values on measurement curves.
In addition, the display lines can also be used to limit the range of search for marker functions.

In vector analyzer mode, the FSE provides four different types of display lines:

- two horizontal threshold lines for marking measurement values or for defining measurement value search ranges – Display Line 1/2,
- two vertical time lines for marking times or for defining time search ranges – Time Line 1/2,
- a threshold line which, for example, sets the search threshold for maximum values (Peak Search) – Threshold Line
- a reference line – Reference Line

For purposes of clarity, each line is annotated on the right side of the display diagram by the following abbreviations:

D1	Display Line 1	D2	Display Line 2
T1	Time Line 1	T2	Time Line 2
TH	Threshold Line	REF	Reference Line

The lines for level, threshold and reference are displayed as continuous, horizontal lines over the full width of the diagram. They are movable in the y-direction.
The lines for time are displayed as vertical, continuous lines over the total height of the diagram. They are movable in the x-direction.

For measurement operations in two separate windows, (Split Screen-Modus), the display lines are available independently in both windows. In the currently active window, the display lines can be activated and/or shifted. Lines previously defined in the currently inactive window remain unchanged.

Note: *The soft keys for setting and switching the display lines on and off operate similar to a three-position switch:*
Initial condition: The line is switched off (soft key has grey background)

1st press: The line is switched on (soft key has red background) and data entry is activated. The position of the display line can be adjusted by using the roll-key, the step keys or through direct numerical inputs via the data-entry keypad. If some other arbitrary function is requested, the data-entry keypad is disabled. In this case, the display line remains switched on (soft key has green background).

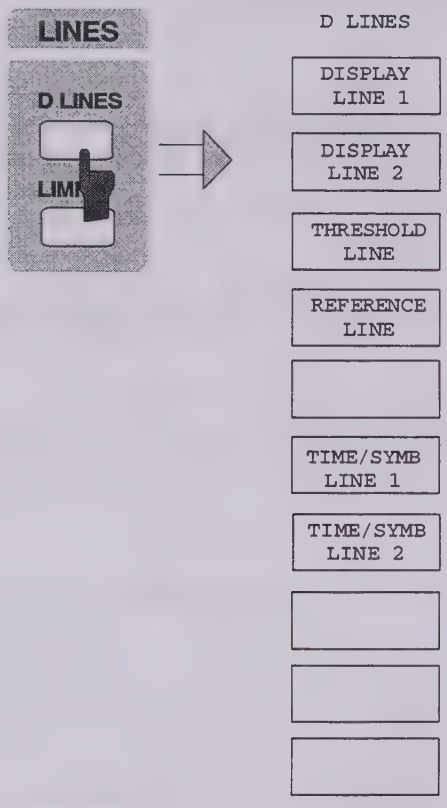
2nd press: The display line is switched off (soft key has grey background).

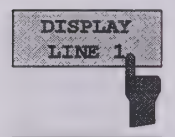
Initial condition: The line is switched on (soft key has green background)

1st press: The line is switched on (soft key has red background) and data entry is activated. The position of the display line can be adjusted by using the roll-key, the step keys or through direct numerical inputs via the data-entry keypad. If any other arbitrary function is requested, the data-entry keypad is disabled. In this case, the display line remains switched on (soft key has green background).

2nd press: The display line is switched off (soft key has grey background).

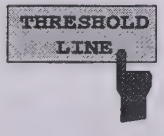
Menu *LINES-D-LINES*





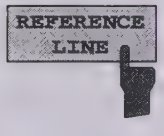
The *DISPLAY LINE 1/2* soft keys switch the display lines on/off and activate the entry of the line location.

The display lines mark the selected levels in the measurement window.

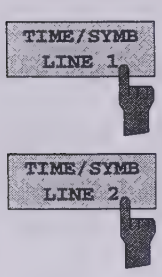


The *THRESHOLD LINE* soft key switches the threshold line on/off and activates the entry of the line location.

The threshold line is a display line which defines a threshold value. This threshold value serves as a lower search limit for maximums/minimums in the marker functions (*MAX PEAK, MIN PEAK, NEXT PEAK* etc.).



The *REFERENCE LINE* soft key switches the reference line on/off and activates the entry of the line position.



The *TIME/SYMB LINE 1/2* soft keys switch the time lines 1/2 on/off and activate the entry of line locations.

The time lines mark the selected times or define the search range (see section "Marker Functions").

2.4.12.2 Limit Lines – *LIMITS Key*

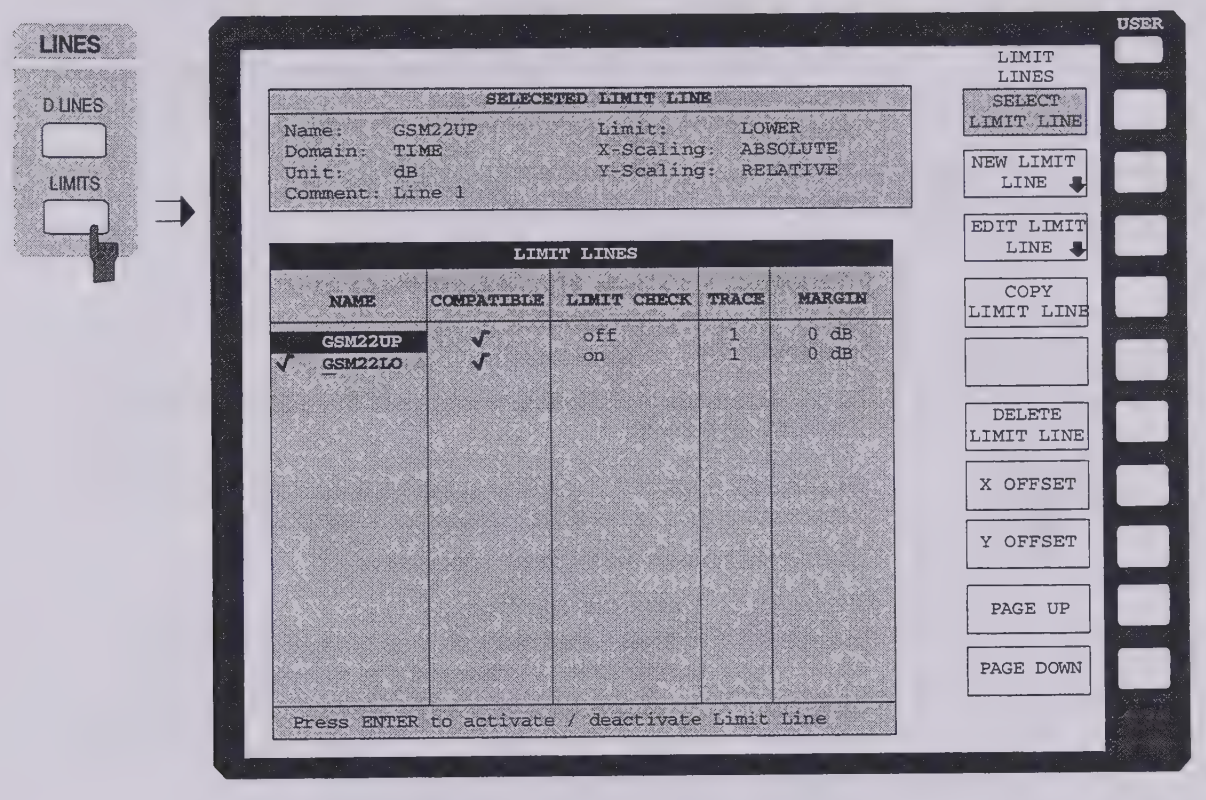
Limit lines are used to define amplitude curves or error boundaries on the display screen which are not to be exceeded. They indicate, for example, the upper limits for modulation errors which are permissible from a Unit Under Test (UUT). For transmission of information in TDMA (e.g. GSM), the amplitude of the bursts in a time slot must adhere to a curve which must fall within a specified tolerance band. The lower and upper limits may each be specified by a limit line. Then, the amplitude curve can be controlled either visually or automatically for any violations of the upper or lower limits (GO/NOGO test).

The FSE supports up to 300 limit lines, each of which may have a maximum of 50 data points. For each limit line, the following characteristics must be defined:

- The name of the limit line. The limit line can be specified for time units or symbols. Time units can be entered as absolute time or time in relation to set reference time. Symbols can be entered as absolute symbols or symbols in relation to set reference symbol
- The reference of the interpolation points to the X-axis. The limit line may be specified either for absolute times or for times which are related to the time on the left edge of the diagram.
- The reference of the interpolation points to the Y-axis. The limit line can be selected either for absolute levels or voltages or referred to the set maximum level (Ref Lvl). If the reference line is switched on, it is used as reference when relative setting has been selected.
- The type of limit line (upper or lower limit). With this information and the active limit checking function (*LIMIT CHECK* soft key), the FSE checks for compliance with each limit.
- The limit line units to be used. The units of the limit line must be compatible with the vertical axis in the active measurement window.
- The measurement curve (trace) to which the limit line is assigned. For the FSE, this defines the curve to which the limit is to be applied when several traces are simultaneously displayed.
- For each limit line, a margin can be defined which serves as a threshold for automatic evaluation.
- In addition, commentary can be written for each limit line, e.g., a description of the application.

In the *LINES LIMITS* menu, the compatible limit lines can be enabled in the *LIMIT LINES* table. The *SELECTED LIMIT LINE* display field provides information concerning the characteristics of the marked limit lines. New limit lines can be specified and edited in the *NEW LIMIT LINE and EDIT LIMIT LINE* sub-menus, respectively.

LINES LIMIT menu

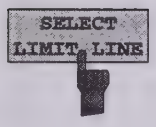


2.4.12.2.1 Limit Line Selection

The *SELECTED LIMIT LINES* table provides information about the characteristics of the marked limit line :

Name	name
Domain	domain and time
Limit	upper/lower limit
X-Scaling	absolute or relative times
Y-Scaling	absolute or relative Y-units
Unit	vertical unit
Comment	commentary

The characteristics of the limit line are set in the *EDIT LIMIT LINE (= NEW LIMIT LINE)* sub-menu.



The *SELECT LIMIT LINE* soft key activates the *LIMIT LINES* table and the selection bar jumps to the uppermost name in the table.

The columns contain the following information:

Name	Enable the limit line.
Compatible	Indicate whether the limit line is compatible with the measurement window of the given trace.
Limit Check	Activate automatic violation check for upper/lower limits.
Trace	Select the measurement curve to which the limit is assigned.
Margin	Define margin.

***Name and Compatible* - Enabling limit lines**

A maximum of 8 limit lines can be enabled at any one time. A check mark at the left edge of a cell indicates that this limit line is enabled. A limit line can only be enabled when it has a check mark in the *Compatible* column, i.e. only when the vertical scales are ***identical*** to those of the display in the measurement window.

Lines with the unit dB are compatible to all dB(..) settings of the Y-axis.

If the trace assigned to a line is not switched on, the line is displayed in the window the trace would be displayed in.

Example:
In split screen mode, trace 2 is assigned measuring window B. A line assigned to trace 2 is always displayed in measurement window B.

If the scale of the Y-axis is changed, all non-compatible limit lines are automatically switched off in order to avoid misinterpretation. The limit lines must be enabled anew when the original display is re-displayed.

***Limit Check* - Activate automatic limit violation check**

When *LIMIT CHECK ON* is activated, a GO/NOGO test is performed. In the center of the diagram, a display window appears which indicates the results of the limit check test:

LIMIT CHECK: PASSED	No violations of active limits.
LIMIT CHECK: FAILED	One or more active limit lines were violated. The message contains the names of the limit lines which were violated or whose margins were not complied with.
LIMIT CHECK: MARGIN	The margin of at least one active limit lines was not complied with, however, no limit line was violated. The message contains the names of the limit lines whose margins were not complied with.

The following example shows 2 active limit lines:

```
LIMIT CHECK: FAILED

LINE VHF_MASK: Failed
LINE UHF2MASK: Margin
```

A check for violations of limit lines takes place only if the limit line of the assigned measurement curve (trace) is enabled.
If *LIM CHECK* is set to *OFF* for all active limit lines, then the limit line check is not executed and the display window is activated.

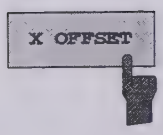
***Trace* - Select the trace to which the limit line is assigned.**

The selection of the measurement curve (trace) takes place in an entry window. Allowed are the integer entries 1, 2, 3 or 4. The default setting is trace 1. If the selected limit line is not compatible with the assigned measurement curve, then the limit line is disabled (display and limit check).

***Margin* - Setting a margin.**

The margin is defined as the signal-level distance to the limit line. When the limit line is defined as an upper limit, the margin means that the level is below the limit line. When the limit line is defined as a lower limit, the margin means that the level is above the limit line. The default setting is 0 dB (i.e. no margin).

The *COPY LIMIT LINE* soft key copies the data file describing the marked limit line and saves it under a new name. In this way, a new limit line can be easily generated by parallel translation or editing of an existing limit line. The name can be arbitrarily chosen and input via an entry window (max. of 8 characters).



The *X OFFSET* soft key activates the entry of the value for horizontally shifting a limit line which has been specified for relative times (X-axis).

The *Y OFFSET* soft key activates the entry of the value for vertically shifting a limit line, which has relative values for the Y-axis (levels or linear units such as volt).

The *DELETE LIMIT LINE* soft key erases the selected limit line. Before deletion, a message appears requesting confirmation.

The *PAGE UP* soft key sets the limit line table to the next page.

The *PAGE DOWN* soft key sets the limit line table to the previous page.

2.4.12.2.2 Entry and Editing of Limit Lines

A limit line is characterized by

- its name
- the scaling in absolute or relative times
- the vertical unit
- the vertical scaling
- the definition of the limit line as either upper or lower limit.
- the data points for time and level or modulation measurement values.

At the time of entry, the FSE immediately checks that all limit lines are in accordance with certain guidelines. These guidelines must be observed if specified operation is to be guaranteed.

- The times for each data point must be entered in ascending order, however, for any single time, two data points may be input (vertical segment of a limit line).

  The data points are allocated in order of ascending time. Gaps are not allowed. If gaps are desired, two separate limit lines must be defined and then both enabled.

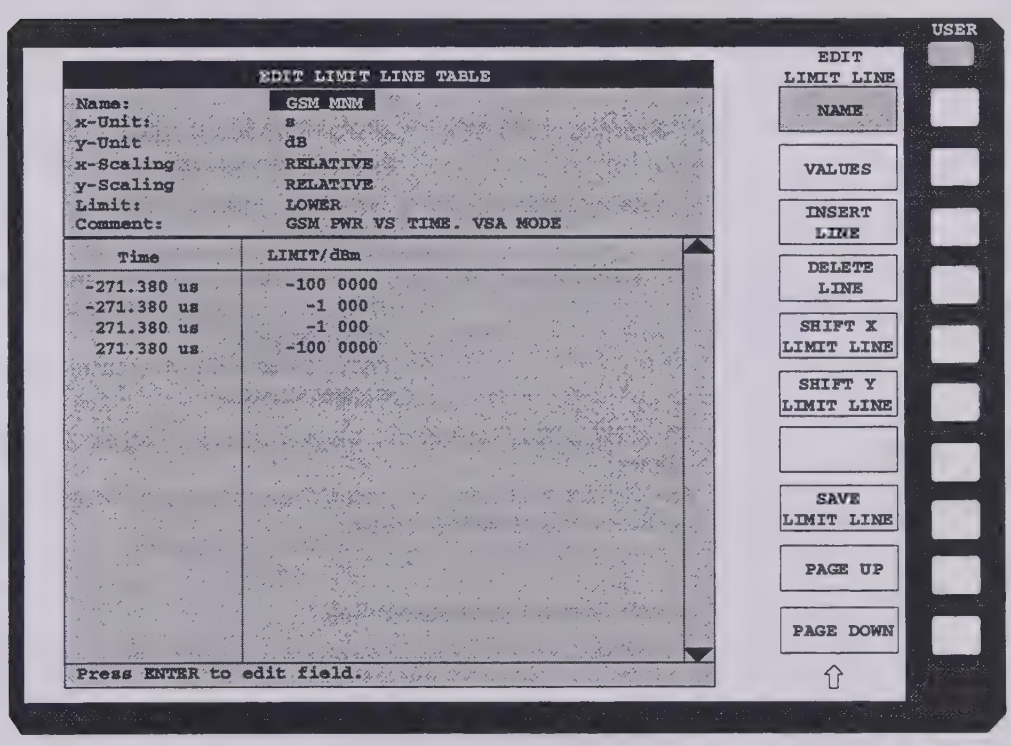
- The entered times must not necessarily be selectable in FSE. A limit line may also exceed the specified time domain sand negative times may also be entered. The allowable range is -1000 s to +1000 s.

- The minimum/maximum value for a limit line is -200 dB to +200 dB for the logarithmic or 10^{-20} to 10^{+20} or-99.9% to + 999.9% for the linear amplitude scales.

LINES LIMIT-EDIT LIMIT LINE menu

The *EDIT LIMIT LINE* and *NEW LIMIT LINE* soft keys both call the *EDIT LIMIT LINE* sub-menu used for editing limit lines. In the table heading, the characteristics of the limit line can be entered. The data points for time and level values are entered in the columns.

Name	Enter name.
Domain	Indication of domain.
X-Scaling	Entry of absolute or relative values for the X-axis
Y-Scaling	Entry of absolute or relative values for the Y-axis
Unit	Select units.
Limit	Select upper/lower limit.
Comment	Enter comments.
Time	Enter time for the data points.
Limit/dBm	Enter magnitudes for the data points.



The *NAME* soft key enables the entry of characteristics in the table heading.

***Name* - Enter name**

A maximum of 8 characters are permitted for each name. All names must be compatible with the MS DOS conventions for file names. The instrument stores all limit lines with the .LIM extension.

***Domain* - Indication of domain**

Only time domain is available in vector analyzer mode.

***Unit* - Select the vertical unit for the limit line**

The selection of the unit is made in the selection box. The default setting is dBm.

***Scaling* - Select absolute or relative scaling**

The limit line can either be scaled in absolute or relative units. Any of the unit keys may be used to toggle between *ABSOLUTE* and *RELATIVE*, the cursor must be positioned in the X-*Scaling* or the *Y-Scaling* line.

X-Scaling ABSOLUTE	The times are interpreted as absolute physical units.
X-Scaling RELATIVE	In the data point table, the times are referred to the left boundary of the diagram.
Y-Scaling ABSOLUTE	The limit values refer to absolute levels or voltages.
Y-Scaling RELATIVE	The limit values refer to the reference level (Ref Level) or, in case a reference line is set, to the reference line. Limit values with the units dB or % are always relative values.

The *RELATIVE* scaling is always suitable, if masks for bursts are to be defined.
An X-offset with half the sweep time may be entered in order to shift the mask into the center of screen.

***Limit* - Select upper/lower limit**

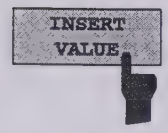
A limit line can be defined as either an upper or lower limit.

***Comment* - Enter comments**

Comments are arbitrary, however, they must be less than 40 characters long.

The *VALUES* soft key activates the entry of the data points in the table columns *Time* and *Limit/dB*..

The desired time data points are entered in ascending order (two repeated time values are permitted).



The *INSERT VALUE* soft key creates an empty line above the current cursor position where a new data point may be entered. However, during the entry of new values, it is necessary to observe an ascending order for time.

The *DELETE VALUE* soft key erases the data point (complete line) at the cursor position. All succeeding data points are shifted down accordingly.

The *SHIFT X LIMIT LINE* soft key calls an entry window where the complete limit line may be shifted parallel in the horizontal direction.

The shift takes place according to the horizontal scale in ns, µs, ms or s

In this manner, a new limit line can be easily generated based upon an existing limit line which has been shifted horizontally and stored (*SAVE LIMIT LINE* soft key) under a new name (*NAME* soft key).

The *SHIFT Y LIMIT LINE* soft key calls an entry window where the complete limit line may be shifted parallel in the vertical direction.

The shift takes place according to the vertical scale:

- for logarithmic units, relative, in dB
- for linear units, as a factor

In this manner, a new limit line can be easily generated based upon an existing limit line which has been shifted vertically and stored (*SAVE LIMIT LINE* soft key) under a new name (*NAME* soft key).

The *SAVE LIMIT LINE* soft key stores the currently edited limit line. The name can be entered in an input window (max. 8 characters)

The *PAGE UP* soft key displays the next page of data points.

The *PAGE DOWN* soft key displays the previous page of data points.

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3.6 Description of Commands

3.6.1 Notation

In the following sections, all commands implemented in the instrument are first listed in tables and then described in detail, separated according to the command system. The notation corresponds to the one of the SCPI standards to a large extent. The SCPI conformity information can be taken from the individual description of the commands.

Table of Commands

Command: In the command column, the table provides an overview of the commands and their hierarchical arrangement (see indentations).

Parameter: The parameter column indicates the requested parameters together with their specified range.

Unit: The unit column indicates the basic unit of the physical parameters.

Remark: In the remark column an indication is made on:
- whether the command does not have a query form,
- whether the command has only one query form
- whether this command is implemented only with a certain option of the instrument

Indentations

The different levels of the SCPI command hierarchy are represented in the table by means of indentations to the right. The lower the level is, the farther the indentation to the right is. Please observe that the complete notation of the command always includes the higher levels as well.

Example: `SENSe:FREQuency:CENTer` is represented in the table as follows:

`SENSe`	first level
`:FREQuency`	second level
`:CENTer`	third level

In the individual description, the complete notation of the command is given. An example for each command is written out at the end of the individual description.

Upper/lower case notation

Upper/lower case letters serve to mark the long or short form of the key words of a command in the description (see Section 3.5.2). The instrument itself does not distinguish between upper and lower case letters.

Special characters

| A selection of key words with an identical effect exists for several commands. These key words are indicated in the same line, they are separated by a vertical stroke. Only one of these key words has to be indicated in the header of the command. The effect of the command is independent of which of the key words is indicated.

Example: `SENSe:FREQuency:CW|:FIXed`

The two following commands of identical meaning can be formed. They set the frequency of the constantly frequent signal to 1 kHz:

`SENSe:FREQuency:CW 1E3 = SENSe:FREQuency:FIXed 1E3`

A vertical stroke in indicating the parameters marks alternative possibilities in the sense of "or". The effect of the command is different, depending on which parameter is entered.

Example: Selection of the parameters for the command

`INPut:COUPling AC | DC`

If parameter AC is selected, only the AC content is fed through, in the case of DC, the DC as well as the AC content.

[ ] Key words in square brackets can be omitted when composing the header (cf. Section 3.5.2, Optional Keywords). The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards.
Parameters in square brackets can optionally be incorporated in the command or omitted as well.

{ } Parameters in braces can optionally be incorporated in the command either not at all, once or several times.

Description of parameters Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has specified a series of definitions therefore, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<...>) and will be briefly explained in the following (see also Section 3.5.5, "Parameters").

<Boolean> This indication refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword **OFF** or by the numeric value 0, the "on" state is indicated by **ON** or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value>

<num> These indications mark parameters which may be entered as numeric values or be set using specific keywords (character data).

The keywords given below are permitted:

MINimum This keyword sets the parameter to the smallest possible value.

MAXimum This keyword sets the parameter to the largest possible value.

DEFault This keyword is used to reset the parameter to its default value.

UP This keyword increments the parameter value.

DOWN This keyword decrements the parameter.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example: `SENSe:FREQuency:CENTer? MAXimum`

returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

3.6.2 Common Commands

The common commands are taken from the IEEE 488.2 (IEC 625-2) standard. Same commands have the same effect on different devices. The headers of these commands consist of an asterisk "*" followed by three letters. Many common commands refer to the status reporting system which is described in detail in Section 3.8.

Command	Designation	Parameter	Remark
*CAL?	Calibration Query		query only
*CLS	Clear Status		no query
*ESE	Event Status Enable	0 to 255	
*ESR?	Standard Event Status Query	0 to 255	query only
*IDN?	Identification Query	<string>	query only
*IST?	Individual Status Query	0 to 255	query only
*OPC	Operation Complete		
*OPT?	Option Identification Query		query only
*PCB	Pass Control Back	0 to 30	no query
*PRE	Parallel Poll Register Enable	0 to 255	
*PSC	Power On Status Clear	0 | 1	
*RST	Reset		no query
*SRE	Service Request Enable	0 to 255	
*STB?	Status Byte Query		query only
*TRG	Trigger		no query
*TST?	Self Test Query		query only
*WAI	Wait to continue		no query

***CAL?**

CALIBRATION QUERY triggers a calibration of the instrument and subsequently query the calibration status. Any responses > 0 indicate errors.

***CLS**

CLEAR STATUS sets the status byte (STB), the standard event register (ESR) and the EVENt-part of the QUEStionable and the OPERation register to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

***ESE 0 to 255**

EVENT STATUS ENABLE sets the event status enable register to the value indicated. Query *ESE? returns the contents of the event status enable register in decimal form.

***ESR?**

STANDARD EVENT STATUS QUERY returns the contents of the event status register in decimal form (0 to 255) and subsequently sets the register to zero.

***IDN?**

IDENTIFICATION QUERY queries the instrument identification.

The device response is for example: "Rohde&Schwarz, FSE, 123456, 1.03"

FSE = Device
123456 = serial number
1.03 = Firmware versions number

***IST?**

INDIVIDUAL STATUS QUERY returns the contents of the IST flag in decimal form (0 I 1). The IST flag is the status bit which is sent during a parallel poll (cf. Section 3.8.3.2).

***OPC**

OPERATION COMPLETE sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request (cf. Section 3.7).

***OPC?**

OPERATION COMPLETE QUERY writes message "1" into the output buffer as soon as all preceding commands have been executed (cf. Section 3.7).

***OPT?**

OPTION IDENTIFICATION QUERY queries the options included in the instrument and returns a list of the options installed. The options are separated from each other by means of commas.

Position	Option	
1	FSE-B3	TV Demodulator
2	FSE-B4	Low Phase Noise & OCXO
3	FSE-B5	FFT-Filter
4		reserved
5	FSE-B7	Vector Signal Analysis
6	FSE-B8	Tracking Generator 3.5 GHz
7	FSE-B9	Tracking Generator 3.5 GHz with I/Q modulator
8	FSE-B10	Tracking Generator 7 GHz
9	FSE-B11	Tracking Generator 7 GHz with I/Q modulator
10	FSE-B12	Output Attenuator for Tracking Generator
11		reserved
12		reserved

Example: `0, FSE-B4, 0, 0, FSE-B7, 0, 0, 0, FSE-B11, FSE-B12, 0, 0`

***PCB 0 to 30**

PASS CONTROL BACK indicates the controller address which the IEC-bus control is to be returned to after termination of the triggered action.

***PRE 0 to 255**

PARALLEL POLL REGISTER ENABLE sets parallel poll enable register to the value indicated. Query *PRE? returns the contents of the parallel poll enable register in decimal form.

***PSC 0 | 1**

POWER ON STATUS CLEAR determines whether the contents of the ENABle registers is maintained or reset in switching on.

*PSC = 0 causes the contents of the status registers to be maintained. Thus a service request can be triggered in switching on in the case of a corresponding configuration of status registers ESE and SRE.

*PSC ≠ 0 resets the registers.

Query *PSC? reads out the contents of the power-on-status-clear flag. The response can be 0 or 1.

***RST**

RESET sets the instrument to a defined default status. The command essentially corresponds to pressing the [PRESET] key. The default setting is indicated in the description of the commands.

***SRE 0 to 255**

SERVICE REQUEST ENABLE sets the service request enable register to the value indicated. Bit 6 (MSS mask bit) remains 0. This command determines under which conditions a service request is triggered. Query *SRE? reads the contents of the service request enable register in decimal form. Bit 6 is always 0.

***STB?**

READ STATUS BYTE QUERY reads out the contents of the status byte in decimal form.

***TRG**

TRIGGER triggers all actions waiting for a trigger event (cf. Section "TRIGger subsystem", as well).

***TST?**

SELF TEST QUERY triggers all selftests of the instrument and outputs an error code in decimal form.

***WAI**

WAIT-to-CONTINUE only permits the servicing of the subsequent commands after all preceding commands have been executed and all signals have settled (cf. Section 3.7 and "*OPC" as well).

3.6.3 ABORt Subsystem

The ABORt subsystem contains the commands for aborting triggered actions. An action can be triggered again immediately after being aborted. All commands trigger events which is why they are not assigned any *RST value.

COMMAND	PARAMETERS	UNIT	COMMENT
ABORt	--	--	no query

ABORt

This command aborts a current measurement and resets the trigger system.

Syntax: ABORt

Example: "ABOR;INIT:IMM"

Features: *RST value: 0
SCPI: conforming

3.6.4 CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquistion, i.e., following the SENSe subsystem.

In the split-screen representation, a distinction is made between CALCulate1 and CALCulate2:

CALCulate1 ≙ screen A;

CALCulate2 ≙ screen B

3.6.4.1 CALCulate:DELTamarker Subsystem

The CALCulate:DELTamarker subsystem checks the delta-marker functions in the instrument.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:DELTamarker<1 to 4>			
[:STATe]	<Boolean>	--	
:MODE	ABSolute|RELative		
:AOFF			no query
:TRACe	<numeric_value>	--	
:X	<numeric_value>	HZ | S | SYM	
:RELative?	--	--	query only
:Y?	--	--	query only
:MAXimum			
[:PEAK]	--	--	no query
:APEak	--	--	no query (option vector analysis)
:NEXT	--	--	no query
:RIGHt	--	--	no query
:LEFT	--	--	no query
:MINimum			
[:PEAK]	--	--	no query
:NEXT	--	--	no query
:RIGHt	--	--	no query
:LEFT	--	--	no query
:FUNCtion			
:FIXed			
[:STATe]	<Boolean>		
:RPOint			
:Y	<numeric_value>	DBM	
:OFFSet	<numeric_value>	DB	
:X	<numeric_value>	HZ IS | SYM	
:PNOise			
[:STATe]	<Boolean>		
:RESult?	--	--	query only
:STEP			
[:INCRement]	<numeric_value>	HZ IS | SYM	
:AUTO	<Boolean>	--	

CALCulate<1|2>:DELTamarker<1 to 4>[:STATe]

This command switches on or off the selected delta marker. If no indication is made, delta marker 1 is selected automatically.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>[:STATe] ON | OFF

Example: "CALC:DELT3 ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:MODE

This command switches over between relative and absolute input of frequency of the delta marker.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MODE ABSolute | RELative

Example: "CALC:DELT:MODE ABS"

Features: *RST value: REL
SCPI: device-specific

In the RELative mode, the frequency of the delta marker is programmed relative to the reference marker. In the ABSolute mode, the frequency is defined by the absolute values.

CALCulate<1|2>:DELTamarker<1 to 4>:AOFF

This command switches off all active delta markers.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:AOFF

Example: "CALC:DELT:AOFF"

Features: *RST value: -
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:TRACe

This command assigns the selected delta marker to the indicated measuring curve.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:TRACe <numeric value>
<numeric value> ::= 1 to 4

Example: "CALC:DELT3:TRAC 2"

Features: *RST value: -
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:X

This command positions the selected delta marker to the indicated frequency (span > 0) or time (span = 0). The query always returns the absolute frequency or time.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:X <numeric value>
<numeric value> ::= 0 to MAX (frequency) | MAX (sweep time) | MAX (symbols)

Example: "CALC:DELT:X 10.7MHz"

Features: *RST value: -
SCPI: device-specific

The SYM unit is only valid in conjunction with option FSE-B7, Vector Signal Analysis.

CALCulate<1|2>:DELTamarker<1 to 4>:X:RELative?

This command queries the frequency (span > 0) or time (span = 0) of the selected delta marker relative to the reference marker.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:X:RELative?

Example: "CALC:DELT:X:REL?"

Features: *RST value: -
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:Y?

This command queries the value of the selected marker.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:Y?

Example: "CALC:DELT:Y?"

Features: *RST value: -
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum[:PEAK]

This command positions the delta marker to the current maximum value in the trace memory.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum[:PEAK]

Example: "CALC:DELT:MAX"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:APEak

This command positions the delta marker to the maximum absolute value of the trace.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:APEak

Example: "CALC:DELT:MAX:APE"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:NEXT

This command positions the delta marker to the next smaller maximum value in the trace memory.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:NEXT

Example: "CALC:DELT:MAX:NEXT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:RIGHt

This command positions the delta marker to the next smaller maximum value to the right of the current value (i.e., in ascending X direction) in the trace memory.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:RIGHt

Example: "CALC:DELT:MAX:RIGH"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:LEFT

This command positions the delta marker to the next smaller maximum value to the left of the current value (i.e., in descending X direction) in the trace memory.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:LEFT

Example: `"CALC:DELT:MAX:LEFT"`

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum[:PEAK]

This command positions the delta marker to the current minimum value in the trace memory.

Syntax: <1|2>:DELTamarker<1 to 4>:MINimum[:PEAK]

Example: "CALC:DELT:MIN"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:NEXT

This command positions the delta marker to the next higher minimum value in the trace memory.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:NEXT

Example: "CALC:DELT:MIN:NEXT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:RIGHt

This command positions the delta marker to the next higher minimum value to the right of the current value (ie in ascending X direction).

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:RIGHt

Example: "CALC:DELT:MIN:RIGH"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:LEFT

This command positions the delta marker to the next higher minimum value to the left of the current value (ie in descending X direction).

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:LEFT

Example: "CALC:DELT:MIN:LEFT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed[:STATe]

This command switches the relative measurement to a fixed reference value on or off.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed[:STATe] ON | OFF

Example: "CALC:DELT:FUNC:FIX ON"

Features: *RST value: OFF
SCPI: device-specific.

The reference value is independent of the current trace.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:Y

This command defines a new fixed reference value for the relative measurement.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:Y
<numeric_value>

Example: "CALC:DELT:FUNC:FIX:RPO:X -10dBm"

Features: *RST value: - (FUNction:FIXed[:STATe] is set to OFF)
SCPI: device-specific

The reference value is independent of the current trace.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:Y:OFFSet

This command defines an additional level offset for the relative measurement.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:Y:OFFSet
<numeric_value>

Example: "CALC:DELT:FUNC:FIX:RPO:Y:OFFS 10dB"

Features: *RST value: 0 dB
SCPI: device-specific

The level offset is included in the output of the level value.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:X

This command defines the new fixed reference frequency, time or symbols for the relative measurement.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:X
<numeric_value>

Example: "CALC:DELT:FUNC:FIX:RPO:X 10.7MHz"

Features: *RST value: - (FUNction:FIXed[:STATe] is set to OFF)
SCPI: device-specific

The reference value is independent of the current trace. With span = 0, the reference time, otherwise the reference frequency is defined.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:PNOise[:STATe]

This command switches the measurement of the phase noise on or off.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:PNOise[:STATe] ON | OFF

Example: "CALC:DELT:FUNC:PNO ON"

Features: *RST value: OFF
SCPI: device-specific

When the phase noise is measured, the correction values for the bandwidth and the log amplifier are automatically considered. The measurement uses the reference values defined by FUNCtion:FIXed:RPOint:X or Y.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:PNOise:RESult?

This command queries the result of the phase noise measurement.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:PNOise:RESult?

Example: "CALC:DELT:FUNC:PNO:RES?"

Features: *RST value: -
SCPI: device-specific

This command is only a query which is why it is not assigned an *RST value.

CALCulate<1|2>:DELTamarker<1 to 4>:STEP[:INCRement]

This command defines the delta marker step width.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:STEP[:INCRement] <numeric_value>

Example: "CALC:DELT:STEP 10kHz" (frequency domain)
"CALC:DELT:STEP 5ms" (time domain)
"CALC:DELT:STEP 20SYM" (time domain)

Features: *RST value: - (STEP is set to AUTO)
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:STEP:AUTO

This command switches the automatic adaptation of the marker step width on or off.

Syntax: CALCulate<1|2>:DELTamarker<1 to 4>:STEP:AUTO ON | OFF

Example: "CALC:DELT:STEP:AUTO OFF"

Features: *RST value: ON
SCPI: device-specific

With AUTO ON, the step width is 10% of the span.

3.6.4.2 CALCulate:DLINe Subsystem

The CALCulate:DLINe subsystem checks the display lines in the instrument, i.e., the level, frequency and time lines (depending on the X-axis) as well as threshold and reference lines.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:DLINe<1|2>	<numeric_value>	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>		
:THReshold	<numeric_value>	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>		
:RLINe	<numeric_value>	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>		
:FLINe<1|2>	<numeric_value>	HZ	
:STATe	<Boolean>		
:TLINe<1|2>	<numeric_value>	S | SYM	
:STATe	<Boolean>		

CALCulate<1|2>:DLINe<1|2>

This command defines the position of the display line.

Syntax: CALCulate:DLINe<1|2> <numeric_value>
<numeric_value>::= MINimum to MAXimum (depending on current unit)

Example: "CALC:DLIN -20dBm"

Features: *RST value: - (STATe to OFF)
SCPI: device-specific

The display lines mark the given level in the display.

The units DEG, RAD, S, HZ, and PCT are only valid in conjunction with option Vector Signal Analysis, FSE-B7.

CALCulate<1|2>:DLINe<1|2>:STATe

This command switches the display line on or off.

Syntax: CALCulate:DLINe<1|2>:STATe ON | OFF

Example: "CALC:DLIN2:STAT OFF"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:THReshold

This command defines the position of the thresholds.

Syntax: CALCulate:THReshold <numeric_value>
<numeric_value>::= MINimum to MAXimum (depending on current unit)

Example: "CALC:THR -82dBm"

Features: *RST value: - (STATe to OFF)
SCPI: device-specific

For marker scan functions MAX PEAK, NEXT PEAK etc., the threshold serves as the lowest limit for maximum or minimum search. The units DEG, RAD, S, HZ, and PCT are only valid in conjunction with option Vector Signal Analysis, FSE-B7.

CALCulate<1|2>:THReshold:STATe

This command switches the threshold on or off.

Syntax: CALCulate:THReshold ON | OFF

Example: "CALC:THR:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:RLINe

This command defines the position of the reference line.

Syntax: CALCulate:RLINe <numeric_value>
<numeric_value>::= MINimum to MAXimum (depending on the current unit)

Example: "CALC:RLIN -10dBm"

Features: *RST value: - (STATe to OFF)
SCPI: device-specific

The reference line serves as a reference for the arithmetic operation of traces.

The units DEG, RAD, S, HZ, and PCT are only valid in connection with option FSE-B7, Vector Signal Analysis.

CALCulate<1|2>:RLINe:STATe

This command switches the reference line on or off.

Syntax: CALCulate:RLINe:STATe ON | OFF

Example: "CALC:RLIN:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:FLINe<1|2>

This command defines the position of the frequency lines.

Syntax: CALCulate:FLINe<1|2> <numeric_value>
<numeric_value>::= 0 GHz to f_{max}

Example: "CALC:FLIN2 120MHz"

Features: *RST value: - (STATe to OFF)
SCPI: device-specific

The frequency lines mark the given frequencies in the display. Frequency lines are only valid for a SPAN >0.

CALCulate<1|2>:FLINe<1|2>:STATe

This command switches the frequency line on or off.

Syntax: CALCulate:FLINe<1|2>:STATe ON | OFF

Example: "CALC:FLIN2:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:TLINe<1|2>

This command defines the position of the time lines.

Syntax: CALCulate:TLINe<1|2> <numeric_value>
<numeric_value>::= 0 to 1000s

Example: "CALC:TLIN 10ms"

Features: *RST value: - (STATe to OFF)
SCPI: device-specific

The time lines mark the given times in the display. Time lines are only valid for a SPAN = 0.

CALCulate<1|2>:TLINe<1|2>:STATe

This command switches the time line on or off.

Syntax: CALCulate:TLINe<1|2>:STATe ON | OFF

Example: "CALC:TLIN2:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

3.6.4.3 CALCulate:FEED Subsystem

The CALCulate:FEED subsystem selects the measured data in operating mode vector signal analysis. This sub system is only valid in connection with option FSE-B7, Vector Signal Analysis.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2> :FEED	<string>		Vector Signal Analysis no query

CALCulate<1|2>:FEED

This command selects the measured data that are to be displayed

Syntax: CALCulate<1|2>:FEED <string>
<string>::= 'XTIM:DDEM:MEAS' |
'XTIM:DDEM:REF' |
'XTIM:DDEM:ERR:MPH' |
'XTIM:DDEM:ERR:VECT' |
'XTIM:DDEM:SYMB' |
'XTIM:AM' |
'XTIM:FM' |
'XTIM:PM' |
'XTIM:AMSummary' |
'XTIM:FMSummary' |
'XTIM:PMSummary' |
'TCAP'

Example: "CALC:FEED 'XTIM:DDEM:SYMB'"

Features: *RST value: 'XTIM:DDEM:MEAS'
SCPI: conforming

The string parameters have the following meaning:

'XTIM:DDEM:MEAS'	Test signal (filtered, synchronized to symbol clock)
'XTIM:DDEM:REF'	Reference signal (internally generated from demodulated test signal)
'XTIM:DDEM:ERR:MPH'	Error signal (magnitude and phase error)
'XTIM:DDEM:ERR:VECT'	Vector error signal
'XTIM:DDEM:SYMB'	Symbol table (demodulated bits and table with modulation errors)
'XTIM:AM'	Demodulated AM signal (analog demodulation)
'XTIM:FM'	Demodulated FM signal (analog demodulation)
'XTIM:PM'	Demodulated PM signal (analog demodulation)
'XTIM:AMSummary'	AM-Summary Marker (analog demodulation)
'XTIM:FMSummary'	FM-Summary Marker (analog demodulation)
'XTIM:PMSummary'	PM-Summary Marker (analog demodulation)
'TCAP'	Test signal in capture buffer

This command is only valid in conjunction with option Vector Signal Analysis, FSE-B7.

3.6.4.4 CALCulate:FORMat Subsystem

The CALCulate:FORMat subsystem determines further processing and conversion of measured data in operating mode vector signal analysis.
This sub system is only valid in connection with option FSE-B7, Vector Signal Analysis.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2> :FORMat	MAGNitude | PHASe | UPHase | RIMag | FREQuency | IEYE | QEYE | TEYE | FEYE | COMP | CONS		Vector Signal Analysis
:FSK :DEViation :REFerence	<numeric_value>	HZ	Vector Signal Analysis

CALCulate<1|2>:FORMat

This command defines the display of the traces.

Syntax: CALCulate<1|2>:FORMat MAGNitude | PHASe | UPHase | RIMag | FREQuency | IEYE | QEYE | TEYE | FEYE | COMP | CONS

Example: "CALC:FORM CONS"

Features: *RST value: MAGNitude
SCPI: conforming

The parameters have the following meaning:

MAGNitude	Display of the magnitude in the time domain
PHASe | UPHase	Display of the phase in the time domain with or without ("unwrapped") limitation to ±180°
RIMag	Display of the time characteristic of inphase and quadrature component
FREQuency	Display of the frequency response in the time domain
IEYE | QEYE	Eye diagram of the inphase or quadrature component
TEYE	Display of the trellis diagram
FEYE	Eye diagram of FSK modulation
COMP	Display of the polar vector diagram (complex)
CONS	Display of the polar vector diagaram (constellation)

This command is only valid in conjunction with option Vector Signal Analysis, FSE-B7.

CALCulate<1|2>:FSK:DEViation:REFerence

This command defines the reference value of the frequency deviation for FSK modulation.

Syntax: CALCulate<1|2>:FSK:DEViation:REFerence <numeric_value>

Example: "CALC:FSK:DEV:REF 20kHz"

Features: *RST value: -
SCPI: device-specific

This command is only valid in conjunction with option Vector Signal Analysis, FSE-B7.

3.6.4.5 CALCulate:LIMit Subsystem

The CALCulate:LIMit subsystem comprises the limit lines and the corresponding limit checks. Limit lines can be defined as upper and lower limit lines. The individual values of the limit lines correspond to the values of the X-axis (CONTrol) which have to have the same number.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate			
:LIMit<1 to 8>			
:STATe	<Boolean>	--	
:UNIT	DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ | DEG | RAD | S | HZ | PCT | UNITLESS		
:CONTrol			
[:DATA]	<numeric_value>,<numeric_value>..	HZ | S | SYM	
:DOMain	FREQuency | TIME		
:OFFSet	<numeric_value>	HZ | S | SYM	
:MODE	RELative | ABSolute		
:UNIT			
[:TIME]	S | SYM		
:SHIFt	<numeric_value>	HZ | S | SYM	Vector Signal Analysis
:UPPer			
[:DATA]	<numeric_value>,<numeric_value>..	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>	--	
:OFFSet	<numeric_value>	DB | DEG | RAD | S | HZ | PCT	
:MARGin	<numeric_value>	DBI DEG | RAD | S | HZ | PCT	
:MODE	RELative | ABSolute	--	
:SHIFt	<numeric_value>	DB | DEG | RADI S | HZ | PCT	
:LOWer			
[:DATA]	<numeric_value>,<numeric_value>..	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>	--	
:OFFSet	<numeric_value>	DBI DEG | RAD | S | HZ | PCT	
:MARGin	<numeric_value>	DBI DEG | RAD | S | HZ | PCT	
:MODE	RELative | ABSolute	--	
:SHIFt	<numeric_value>	DB | DEG | RAD | S | HZ | PCT	
:FAIL?			query only
:CLEar		--	
[:IMMediate]	--	--	no query
:COMMent			
:COPY	<string>		
:NAME	1 to 8 | < name>		
:DELete	<string>		
:BURSt	--		Option FSE-K11 or K10
:PTEMplate?			
:POWer?	--		

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate			
:LIMit<1 to 8>		--	
:SPECtrum	--		Option FSE-K11 or FSE-K10
:MODulation?	ARFCn | TXBand | RXBand | COMBined | DCSRx1800		
:FAILs?	ARFCn | TXBand | RXBand | COMBined | DCSRx1800		
:EXCeptions?	ARFCn | TXBand | RXBand | COMBined | DCSRx1800		
:SWITching?	ARFCn | OTXBand | RXBand | IDLeband		Option FSE-K11 or FSE-K10
:FAILs?	ARFCn | OTXBand | RXBand | IDLeband		
:SPURious?	TXBand | TXBand | RXBand | COMBined		Option FSE-K11 or FSE-K10
:FAILs?	TXBand | OTXBand | RXBand | IDLeband		
:MARGin	<numeric_value>	DB	
:ACPower			
[:STATe]	<Boolean>		
:ACHannel	<numeric_value>, <numeric_value>	DB; DB	
:STATe	<Boolean>		
:RESult?	--		query only
:ALTernate<1|2>	<numeric_value>, <numeric_value>	DB; DB	
:STATe	<Boolean>		
:RESult?	--		query only

CALCulate<1|2>:LIMit<1 to 8>:STATe

This command switches the limit check for the selected limit line on or off.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:STATe ON | OFF

Example: `"CALC:LIM:STAT ON"`

Features: *RST value: OFF
SCPI: conforming

The result of the limit check can be queried with `CALCulate:LIMit:FAIL?`.

CALCulate<1|2>:LIMit<1 to 8>:UNIT

This command defines the unit of the selected limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:UNIT DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_MHZ | DBMV_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ | DEG | RAD | S | HZ | PCT | UNITLESS

Example: `"CALC:LIM:UNIT DBUV"`

Features: *RST value: DBM
SCPI: device-specific

DBUV_MHZ and DBUA_MHZ denote the units DBUV/MHZ or DBUA/MHZ. The units DEG, RAD, S, HZ, PCT are available in the signal analysis mode only.
Upon selection of the unit DB the limit line is automatically switched to the relative mode. For units different from DB the limit line is automatically switched to the absolute mode.

CALCulate<1|2>:LIMit<1 to 8>:CONTrol[:DATA]

This command defines the X-axis values (frequencies or times) of the upper or lower limit lines.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CONTrol[:DATA]
<numeric_value>,<numeric_value>..

Example: "CALC:LIM:CONT 1MHz,30MHz,300MHz,1GHz"

Features: *RST value: - (LIMit:STATe is set to OFF)
SCPI: conforming

The number of values for the CONTrol axis and the corresponding UPPer- and/or LOWer limit lines have to be identical.

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:DOMain

This command defines the X-axis in the frequency or time domain.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CONTrol:DOMain FREQuency | TIME

Example: "CALC:LIM:CONT:DOM TIME"

Features: *RST value: FREQuency
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:OFFSet

This command defines an offset for the X-axis value of the selected relative limit line in the frequency or time domain.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CONTrol:OFFset <numeric_value>

Example: "CALC:LIM:CONT:OFFS 100us"

Features: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:MODE

This command selects the relative or absolute scaling for the X-axis of the selected limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CONTrol:MODE RELative | ABSolute

Example: "CALC:LIM:CONT:MODE REL"

Features: *RST value: ABSolute
SCPI: device-specific

Upon selection of RELative, the unit is switched to DB.

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:UNIT[:TIME]

This command defines the unit of the x-axis scaling of limit lines.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CONTrol:UNIT[:TIME] S | SYM

Example: "CALC:LIM:CONT:UNIT SYM"

Features: *RST value: S
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:SHIFt

This command shifts a limit line which has been specified for relative frequencies or times (X-axis).

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CONTrol:SHIFt <numeric_value>

Example: "CALC:LIM:CONT:SHIF 50kHz"

Features: *RST value: --
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:LIMit<1 to 8>:UPPer[:DATA]

This command defines the values for the upper limit lines.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:UPPer[:DATA]
<numeric_value>,<numeric_value>..

Example: "CALC:LIM:UPP -10,0,0,-10"

Features: *RST value: - (LIMit:STATe is set to OFF)
SCPI: conforming

The number of values for the CONTrol axis and the corresponding UPPer limit line have to be identical. If the measured values exceed the UPPer limit line, the limit check signals errors. The unit must be identical with the unit selected by CALC:LIM:UNIT. The units DEG, RAD, S, HZ, PCT are available in the vector signal analysis mode only.

CALCulate<1|2>:LIMit<1 to 8>:UPPer:STATe

This command defines the selected limit line as upper limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:UPPer:STATe ON | OFF

Example: "CALC:LIM:UPPer:STAT ON"

Features: *RST value: OFF
SCPI: conforming

The result of the limit check can be queried with CALCulate:LIMit<1 to 8>:FAIL?.

CALCulate<1|2>:LIMit<1 to 8>:UPPer:OFFSet

This command defines an offset for the Y-axis of the selected relative upper limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:UPPer:OFFset <numeric_value>

Example: "CALC:LIM:UPP:OFFS 3dB"

Features: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:MARGin

This command defines the margin of the selected upper limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:UPPer:MARGin <numeric_value>

Example: "CALC:LIM:UPP:MARG 10dB"

Features: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:MODE

This command selects the relative or absolute scaling for the Y-axis of the selected upper limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:UPPer:MODE RELative | ABSolute

Example: "CALC:LIM:UPP:MODE REL"

Features: *RST value: ABSolute
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:SHIFt

This command shifts a limit line, which has relative values for the Y-axis (levels or linear units such as volt).

Syntax: CALCulate<1|2>:LIMit<1 to 8>:Upper:SHIFt <numeric_value>

Example: "CALC:LIM:UPP:SHIF 20dB"

Features: *RST value: --
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:LIMit<1 to 8>:LOWer[:DATA]

This command defines the values for the selected lower limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:LOWer[:DATA]
<numeric_value>,<numeric_value>..

Example: "CALC:LIM:LOW -30,-40,-40,-30"

Features: *RST value: - (LIMit:STATe is set to OFF)
SCPI: conforming

The number of values for the CONTrol axis and the corresponding LOWer limit line have to be identical. If the measured values violate the LOWer limit line, the limit check signals errors.
The unit must be identical with the unit selected by CALC:LIM:UNIT. The units DEG, RAD, S, HZ, PCT are available in the vector signal analysis mode only.

CALCulate<1|2>:LIMit<1 to 8>:LOWer:STATe

This command defines the selected limit line as lower limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:LOWer:STATe ON | OFF

Example: `"CALC:LIM:LOWer:STAT ON"`

Features: *RST value: OFF
SCPI: conforming

The result of the limit check can be queried with `CALCulate:LIMit:FAIL?`.

CALCulate<1|2>:LIMit<1 to 8>:LOWer:OFFSet

This command defines an offset for the Y-axis of the selected relative lower limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:LOWer:OFFset <numeric_value>

Example: `"CALC:LIM:LOW:OFFS 3dB"`

Features: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:MARGin

This command defines the margin of the selected lower limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:LOWer:MARGin <numeric_value>

Example: `"CALC:LIM:LOW:MARG 10dB"`

Features: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:MODE

This command selects the relative or absolute scaling for the Y-axis of the selected lower limit line.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:LOWer:MODE RELative | ABSolute

Example: `"CALC:LIM:LOW:MODE REL"`

Features: *RST value: ABSolute
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:SHIFt

This command shifts a limit line, which has relative values for the Y-axis (levels or linear units such as volt).

Syntax: CALCulate<1|2>:LIMit<1 to 8>:LOWer:SHIFt <numeric_value>

Example: `"CALC:LIM:LOW:SHIF 20dB"`

Features: *RST value: --
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:LIMit<1 to 8>:FAIL?

This command queries the result of the limit check.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:FAIL?

Example: `"CALC:LIM:FAIL?"`

Features: *RST value: -
SCPI: conforming

The result of the limit check responds with 0 in case of PASS and with 1 in case of FAIL.

CALCulate<1|2>:LIMit<1 to 8>:CLEar[:IMMediate]

This command deletes the result of the current limit check.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:CLEar[:IMMediate]

Example: `"CALC:LIM:CLE"`

Features: *RST value: -
SCPI: conforming

This command is an event which is why it is not assigned an *RST value.

CALCulate<1|2>:LIMit<1 to 8>:COMMent

This command defines a comment for the limit line selected.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:COMMent <string>

Example: `"CALC:LIM:COMM 'Upper limit for spectrum'"`

Features: *RST value: blank comment
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:COPY

This command copies one limit line onto another one.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:COPY 1 to 8 | <name>
1 to 8 ::= number of the new limit line or, alternatively:
<name> ::= name of the new limit line given as a string

Example: `"CALC:LIM1:COPY 2"`
`"CALC:LIM1:COPY 'GSM2'"`

Features: *RST value: --
SCPI: device-specific

The name of the limit line may contain a maximum of 8 characters. This command is an "event" which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:LIMit<1 to 8>:NAME

This command assigns a name to a limit line numbered 1 to 8. If it doesn't exist previously, a limit line with this name is created.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:NAME <string>
<string> ::= name off limit line

Example: "CALC:LIM1:NAME 'GSM1'"

Features: *RST value: 'REM1' to 'REM8' for lines 1 to 8
SCPI: device-specific

The name of the limit line may contain a maximum of 8 characters.

CALCulate<1|2>:LIMit<1 to 8>:DELete

This command deletes the limit line selected.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:DELete

Examples: "CALC:LIM1:DEL"

Features: *RST value: --
SCPI: device-specific

This command is an "event" which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:LIMit<1 to 8>:BURSt:PTEMplate?

This command queries the result of the limit check for a power vs. time measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:BURSt:PTEMplate?

Examples: "CALC:LIM:BURS:PTEM?"

The result is displayed in character data form. Possible values are:

PASSED	limit not exceeded
FAILED	limit exceeded
RUNNING	measurement not completed

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
If no measurement has been carried out yet, a query error is triggered off. The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:BURSt:POWer?

This command queries the total result of the carrier power measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:BURSt:POWer?

The result is displayed in character data form. Possible values are:

PASSED	limit not exceeded
FAILED	limit exceeded
ABORTED	measurement aborted
RUNNING	measurement not completed

Examples: "CALC:LIM:BURS:POW?"
Result: PASSED

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
If the command is triggered off before the carrier power measurement was started for the first time, a query error results. The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:MODulation?

This command queries the total result of the spectrum due to modulation measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:MODulation?
ARFCn | TXBand | RXBand | COMBined | DCSRx1800
ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-band
RXBand::= RX-band
COMBined::= ARFCN ± 1.8 MHz / TX-band
DCSRx1800::= RX-Band DCS 1800 (option FSE-K10 only)

The result is displayed in character data form. Possible values are:

PASSED	limit not exceeded
FAILED	limit exceeded
ABORTED	measurement aborted
RUNNING	measurement not completed

Examples: "CALC:LIM:SPEC:MOD? RXB"
Result: PASSED

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:MODulation:FAILs?

This command queries the number of limit violations of the spectrum due to modulation measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:MODulation:FAILs? ARFCn | ARFCn | TXBand | RXBand | COMBined | DCSRx1800
ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-band
RXBand::= RX-band
COMBined::= ARFCN ± 1.8 MHz / TX-band
DCSRx1800::= RX-Band DCS 1800 (option FSE-K10 only)

Examples: "CALC:LIM:SPEC:MOD:FAIL? RXB"

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:MODulation:EXCeptions?

This command queries the number of limit violations of the spectrum due to modulation measurement which are marked as exceptions.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:MODulation:EXCeptions? ARFCn | TXBand | RXBand | COMBined | DCSRx1800
ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-band
RXBand::= RX-band
COMBined::= ARFCN ± 1.8 MHz / TX-band
DCSRx1800::= RX-Band DCS 1800 (option FSE-K10 only

Examples: "CALC:LIM:SPEC:MOD:EXC? RXB"

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:SWITching?

This command queries the total result of the spectrum due to switching transients measurements.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:SWITching?
ARFCn | TXBand | RXBand | COMBined

ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-band
RXBand::= RX-band
COMBined::= ARFCN ± 1.8 MHz / TX-band

The result is displayed in character data form. Possible values are:

PASSED	limit not exceeded
FAILED	limit exceeded
ABORTED	measurement aborted
RUNNING	measurement not completed

Examples: "CALC:LIM:SPEC:SWIT?"
Result: PASSED

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:SWITching:FAILs?

This command queries the number of limit violations of the spectrum due to switching transient measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPECtrum:SWITching:FAILs?
ARFCn | TXBand | RXBand | COMBined

ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-band
RXBand::= RX-band
COMBined::= ARFCN ± 1.8 MHz / TX-band

Examples: "CALC:LIM:SPEC:SWIT:FAIL?"

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPURious?

This command queries the total result of the spurious emissions measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPURious?
TXBand | OTXBand | RXBand | IDLeband

TXBand::= TX-band
OTXBand::= Not TX-band
RXBand::= RX-band (option FSE-K11 only)
IDLeband::= IDLeband (option FSE-K10 only)

The result is displayed in character data form. Possible values are:

PASSED	limit not exceeded
FAILED	limit exceeded
ABORTED	measurement aborted
RUNNING	measurement not completed

Examples:
```
"CALC:LIM:SPUR? OTXB"
Result:PASSED
```

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:SPURious:FAILs?

This command queries the number of limit violations of the spurious emissions measurement.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:SPURious:FAILs?
TXBand | OTXBand | RXBand | IDLeband

TXBand::= TX-band
OTXBand::= Not TX-band
RXBand::= RX-band (option FSE-K11 only)
IDLeband::= IDLeband (option FSE-K10 only)

Examples:
```
"CALC:LIM:SPUR:FAIL? OTXB"
```

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. It is available with option GSM BTS analyzer FSE-K11 or GSM MS Analyzer FSE-K10.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:MARGin

This command sets/changes the value of the margin (safe difference to the actual limit) for the limit check.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:MARGin <numeric_value>
<numeric_value> ::= 0 to 100DB

Examples:
```
"CALC:LIM:MARG 6DB"
```

Features: *RST value: 3DB
SCPI: device-specific

This command is available with options GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10 only. The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower[:STATe]

This command switches on and off the limit check for adjacent channel power measurements. The commands `CALC:LIM:ACP:ACH:STAT` or `CALC:LIM:ACP:ALT:STAT` must be used in addition to specify whether the limit check is to be performed for the upper/lower adjacent channel or for the alternate adjacent channels.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower[:STATe] ON | OFF

Examples: `"CALC:LIM:ACP ON"`

Features: *RST value: OFF
SCPI: device-specific

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel

This command defines the limit for the upper/lower adjacent channel for adjacent channel power measurements.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel <num_value>,<num_value>
<numeric_value> ::= 0 to 100 dB.
The first (second) numeric value is the limit for the upper (lower) adjacent channel.

Examples: `"CALC:LIM:ACP:ACH 30DB, 30DB"`

Features: *RST value: 0 dB
SCPI: device-specific

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:STATe

This command activates the limit check for the adjacent channel when adjacent channel power measurement is performed. Before, the limit check must be activated using `CALC:LIM:ACP ON`.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:STATe ON | OFF

Examples: `"CALC:LIM:ACP:ACH:STAT ON"`

Features: *RST value: OFF
SCPI: device-specific

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:RESult?

This command queries the result of the limit check for the upper/lower adjacent channel when adjacent channel power measurement is performed.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:RESult?

The result is returned in the form <result>, <result> where
<result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Examples: `"CALC:LIM:ACP:ACH:RES?"`

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. If the power measurement of the adjacent channel is switched off, the command triggers a query error.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>

This command defines the limit for the first/second alternate adjacent channel for adjacent channel power measurements.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>
<numeric_value>,<numeric_value>

<numeric_value> ::= 0 to 100DB.

The first (second) numeric value is the limit for the lower (upper) alternate adjacent channel. The numeric suffix after `ALTernate<1|2>` denotes the first or the second alternate channel.

Examples: `"CALC:LIM:ACP:ALT2 30DB 30DB"`

Features: *RST value: 0DB
SCPI: device-specific

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:STATe

This command activates the limit check for the first/second alternate adjacent channel for adjacent channel power measurements. Before, the limit check must be activated using `CALC:LIM:ACP ON`.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:STATe ON | OFF

Examples: `"CALC:LIM:ACP:ALT2:STAT ON"`

Features: *RST value: OFF
SCPI: device-specific

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:RESult?

This command queries the result of the limit check for the first/second alternate adjacent channel for adjacent channel power measurements.

Syntax: CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:RESult?
The result is returned in the form <result>, <result> where
<result> = PASSED | FAILED and where the first (second) returned value denotes the lower (upper) alternate adjacent channel.

Examples: `"CALC:LIM:ACP:ALT2:RES?"`

Features: *RST value: --
SCPI: device-specific

This command is a query and therefore not assigned a *RST value. If the power measurement of the adjacent channel is switched off, the command triggers a query error.
The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

3.6.4.6 CALCulate:MARKer Subsystem

The CALCulate:MARKer subsystem checks the marker functions in the instrument.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer<1 to 4>			
[:STATe]	<Boolean>	--	
:AOFF			no query
:TRACe	<numeric_value>	--	
:X	<numeric_value>	HZ|S	
:SLIMits			
[:STATe]	<Boolean>		
:COUNt	<Boolean>	--	
:RESolution	<numeric_value>	HZ	
:FREQuency?	--	--	query only
:COUPled			
[:STATe]	<Boolean>		
:LOEXclude	<Boolean>		
:Y?	--	--	query only
:MAXimum			
[:PEAK]	--	--	no query
:APEak	--	--	no query, Vector Signal Analysis
:NEXT	--	--	no query
:RIGHt	--	--	no query
:LEFT	--	--	no query
:MINimum			
[:PEAK]	--	--	no query
:NEXT	--	--	no query
:RIGHt	--	--	no query
:LEFT	--	--	no query
:STEP			
[:INCRement]	<numeric_value>	HZ | S | SYM	
:AUTO	<Boolean>	--	
:PEXCursion	<numeric_value>	dB	
:READout	MPHase | RIMaginary		Vector Signal Analysis
:FUNCtion			
:NDBDown	<numeric_value>	DB	
:STATe	<Boolean>		
:RESult?	--	--	query only
:FREQuency?	--	--	query only
:ZOOM	<numeric_value>	HZ	no query
:NOISe			
[:STATe]	<Boolean>		
:RESult?	--	--	query only
:DEModulation			
:SELect	AMIFM		
[:STATe]	<Boolean>		
:HOLDoff	<numeric_value>	S	
:SFACtor	<expr>		
:STATe	<Boolean>		
:RESult?	--	--	query only
:FREQuency?	--	--	query only

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer			
:FUNCtion			
:STRack	<Boolean>		
[:STATe]			
:ADEMod			Vector Signal Analysis
:AM			
[:RESult?]	PPEak | MPEak | MIDDle | RMS		query only
:FM			
[:RESult?]	PPEak | MPEak | MIDDle | RMS | RDEV		query only
:PM			
[:RESult?]	PPEak | MPEak | MIDDle | RMS		query only
:AFRequency			
[:RESult?]			query only
:FERRor			
[:RESult?]			query only
:SINad			
[:STATe]	<Boolean>		
:RESult?			query only
:CARRier			
[:RESult?]			query only
:DDEMod			Vector Signal Analysis
:RESult?	MERM | MEPK | MEPS | PERM | PEPK | PEPS |EVRM | EVPK | EVPS | IQOF | IQIM | ADR | FERR | DEV | FSRM | FSPK | FSPS | RHO |FEPK | DTTS		query only
:POWer			
:SELect	ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0		no query
:RESult?	ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0		query only
:PRESet	NADC | TETRA | PHSI PDC | CDPD | CDMA | NONE		
:CFILter	<Boolean>		
[:STATe]	OFF		no query
:SUMMary			
:MAXimum			Vector Signal Analysis
[:STATe]	<Boolean>		
:RESult?			query only
:PPEak			Vector Signal Analysis
[:STATe]	<Boolean>		
:RESult?			query only
:MPEak			Vector Signal Analysis
[:STATe]	<Boolean>		
:RESult?			query only
:MIDDle			Vector Signal Analysis
[:STATe]	<Boolean>		
:RESult?			query only
:RMS			
[:STATe]	<Boolean>		
:RESult?			query only
:MEAN			
[:STATe]	<Boolean>		
:RESult?			query only
:PHOLd	<Boolean>		
:AVERage	<Boolean>		
:AOFF			no query

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer			
:FUNCtion			
:CENTer			no query
:CSTep			no query
:STARt			no query
:STOP			no query
:MSTep			no query
:REFerence			no query

CALCulate<1|2>:MARKer<1 to 4>[:STATe]

This command switches on or off the currently selected marker. If no indication is made, marker 1 is selected automatically.

Syntax: CALCulate<1|2>:MARKer<1 to 4>[:STATe] ON | OFF

Example: "CALC:MARK3 ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:AOFF

This command switches off all active markers.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:AOFF

Example: "CALC:MARK:AOFF"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:TRACe

This command assigns the selected marker (1 to 4) to the indicated test curve.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:TRACe <numeric value>
<numeric value> ::= 1 to 4

Example: "CALC:MARK3:TRAC 2"

Features: *RST value -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:X

This command positions the selected marker to the indicated frequency (span > 0) or time (span = 0).

Syntax: CALCulate<1|2>:MARKer<1 to 4>:X <numeric value>
<numeric value> ::= 0 to MAX (frequency) | MAX (sweep time)

Example: "CALC:MARK:X 10.7MHz"

Features: *RST value: -
SCPI: device-specific

The unit SYM is available in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:X:SLIMits[:STATe]

This command switches between a limited (ON) and unlimited (OFF) search range.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:X:SLIMits[STATe] ON | OFF

Example: "CALC:MARK:X:SLIM ON"

features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:COUNt

This command switches on or off the frequency counter at the marker position.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:COUNt ON|OFF

Example: "CALC:MARK:COUN ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:COUNt:RESolution

This command specifies the resolution of the frequency counter.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:COUNt:RESolution <numeric value>
<numeric value> ::= 0.1 | 1 | 10 | 100 | 1000 | 10000 Hz

Example: "CALC:MARK:COUN:RES 1kHz"

Features: *RST value: 1kHz
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:COUNt:FREQuency

This command queries the result of the frequency counter.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:COUNt:FREQuency?

Example: "CALC:MARK:COUN:FREQ?"

Features: *RST value: -
SCPI: device-specific

This command is only a query and thus has no *RST value.

CALCulate<1|2>:MARKer<1 to 4>:COUPled[:STATe]

This command switches the coupling of markers on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:COUPling[:STATe] ON | OFF

Example: "CALC:MARK:COUP ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:LOEXclude

This command switches the local oscillator suppression on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:LOEXclude ON | OFF

Example: "CALC:MARK:LOEX ON"

Features: *RST value: OFF
SCPI: device-specific

The numeric suffixes 1|2 and 1 to 4 are not significant.

CALCulate<1|2>:MARKer<1 to 4>:Y?

This command queries the selected marker value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:Y?

Example: "CALC:MARK:Y?"

Features: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:MAXimum[:PEAK]

This command positions the marker to the current maximum value in the trace memory.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MAXimum[:PEAK]

Example: "CALC:MARK:MAX"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:APEak

This command positions the marker to the maximum absolute value of the trace.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MAXimum:APEak

Example: "CALC:MARK:MAX:APE"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:NEXT

This command positions the marker to the next lower maximum value in the trace memory.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MAXimum:NEXT

Example: "CALC:MARK:MAX:NEXT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:RIGHt

This command positions the marker to the next smaller maximum value to the right of the current value (i.e., in ascending X direction) in the trace memory.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MAXimum:RIGHt

Example: "CALC:MARK:MAX:RIGH"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:LEFT

This command positions the marker to the next smaller maximum value to the left of the current value (i.e., in descending X direction) in the trace memory.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MAXimum:LEFT

Example: "CALC:MARK:MAX:LEFT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MINimum[:PEAK]

This command positions the marker to the current minimum value in the trace memory.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MINimum[:PEAK]

Example: "CALC:MARK:MIN"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MINimum:NEXT

This command positions the marker to the next higher minimum value in the trace memory.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MINimum:NEXT

Example: "CALC:MARK:MIN:NEXT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MINimum:RIGHt

This command positions the marker to the next higher minimum value to the right of the current value (ie in ascending X direction).

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MINimum:RIGHt

Example: "CALC:MARK:MIN:RIGH"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:MINimum:LEFT

This command positions the marker to the next higher minimum value to the left of the current value (ie in descending X direction).

Syntax: CALCulate<1|2>:MARKer<1 to 4>:MINimum:LEFT

Example: "CALC:MARK:MIN:LEFT"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:STEP[:INCRement]

This command defines the marker step width.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:STEP[:INCRement] <numeric_value>

Example: "CALC:MARK:STEP 10kHz" (frequency domain)
"CALC:MARK:STEP 5ms" (time domain)
"CALC:MARK:STEP 20SYM" (time domain)

Features: *RST value: - (STEP is set to AUTO)
SCPI: device-specific

This command sets STEP:AUTO to OFF.

CALCulate<1|2>:MARKer<1 to 4>:STEP:AUTO

This command switches the automatic adaptation of the marker step width on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:STEP:AUTO ON | OFF

Example: "CALC:MARK:STEP:AUTO OFF"

Features: *RST value: ON
SCPI: device-specific

With AUTO ON, the step width is 10% of the span.

CALCulate<1|2>:MARKer<1 to 4>:PEXCursion

This command defines the peak excursion.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:PEXCursion <numeric_value>

Example: "CALC:MARK:PEXC 10dB"

Features: *RST value: 6dB
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:READout

This command determines the type of the marker display.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:READout MPHase | RIMaginary

Example: "CALC:MARK:READ RIM"

Features: *RST value: -
SCPI: device-specific

This command is only valid in operating mode Vector Signal Analysis (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown

This command defines the "N dB Down" value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown <numeric_value>

Example: "CALC:MARK:FUNC:NDBD 3dB"

Features: *RST value: 6dB
SCPI: device-specific

The temporary markers T1 and T2 are positioned by n dB below the active reference marker. The frequency spacing of these markers can be queried with `CALCulate:MARKer:FUNCtion:NDBDown:RESult?`.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:STATe

This command switches the "N dB Down" function on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:STATe ON | OFF

Example: "CALC:MARK:FUNC:NDBD:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:RESult?

This command queries the frequency spacing (bandwidth) of the "N dB Down" markers.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:RESult?

Example: "CALC:MARK:FUNC:NDBD:RES?"

Features: *RST value: -
SCPI: device-specific

This command is only a query which is why it is not assigned an *RST value.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:FREQuency?

This command queries the frequencies of the "N dB Down" marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:FREQuency?

Example: "CALC:MARK:FUNC:NDBD:FREQ?"

Features: *RST value: -
SCPI: device-specific

The two frequency values are separated by comma and indicated in ascending order. This command is only a query which is why it is not assigned an *RST value.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ZOOM

This command defines the range to be enlarged around the active marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ZOOM <numeric_value>

Example: "CALC:MARK:FUNC:ZOOM 1kHz"

Features: *RST value: -
SCPI: device-specific

The subsequent frequency sweep is stopped at the marker position and the frequency of the signal is counted. This frequency becomes the new center frequency, the zoomed span is then set. This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NOISe[:STATe]

This command switches the noise measurement on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NOISe[:STATe]ON | OFF

Example: "CALC:MARK:FUNC:NOIS ON"

Features: *RST value: OFF
SCPI: device-specific

The noise power density is measured at the position of the markers. The result can be queried with CALCulate:MARKer:FUNCtion:NOISe:RESult?.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NOISe:RESult?

This command queries the result of the noise measurement.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NOISe:RESult?

Example: "CALC:MARK:FUNC:NOIS:RES?"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:SELect

This command selects the demodulation type.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:SELect AM | FM

Example: "CALC:MARK:FUNC:DEM:SEL FM"

Features: *RST value: AM
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation[:STATe]

This command switches the demodulation on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation[:STATe] ON | OFF

Example: "CALC:MARK:FUNC:DEM ON"

Features: *RST value: OFF
SCPI: device-specific

With demodulation switched on, the frequency sweep is stopped at the marker position and the signal is demodulated during the given stop time.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:HOLDoff

This command defines the duration of the stop time for the demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:HOLDoff <num_value>
<numeric_value>::= 10ms to 1000s

Example: "CALC:MARK:FUNC:DEM:HOLD 3s"

Features: *RST value: - (DEModulation is set to OFF)
SCPI: device-specific

With demodulation switched on, the frequency sweep is stopped at the marker position and the signal is demodulated during the given stop time.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor

This command defines the shape factor measurement 60dB/6dB or 60dB/3dB.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor <expr>::=(60dB/3dB) | (60dB/6dB)

Example: "CALC:MARK:FUNC:SFAC (60dB/3dB)"

Features: *RST value: (60dB/6dB)
SCPI: device-specific

The temporary markers T1 to T4 are positioned in pairs by 60dB and by 3dB or 6dB below the active reference marker. The frequency spacing ratio of these markers - the shape factor - can be queried with CALCulate:MARKer:FUNCtion:SFACtor:RESult?.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor:STATe

This command switches the shape factor measurement on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor:STATe ON | OFF

Example: "CALC:MARK:FUNC:SFAC:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor:RESult?

This command queries the result of the shape factor measurement.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor:RESult?

Example: "CALC:MARK:FUNC:SFAC:RES?"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor:FREQuency?

This command queries the frequencies of the shape factor measurement.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SFACtor:FREQuency?

Example: "CALC:MARK:FUNC:SFAC:FREQ?"

Features: *RST value: -
SCPI: device-specific

Four frequency values (at -60 dB, -6 or. -3 dB, -6 or -3 dB, -60dB) are indicated in ascending order. They are separated by a comma. This command is only a query which is why it is not assigned an *RST value.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack[:STATe]

This command switches the signal-track function on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack[:STATe] ON | OFF

Example: "CALC:MARK:FUNC:STR ON"

Features: *RST value: OFF
SCPI: device-specific

With SIGNAL TRACK function activated, the maximum signal is determined after each frequency sweep and the center frequency of this signal is set. With drifting signals the center frequency follows the signal.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:AM[:RESult?]

This command queries the results of the AM modulation measurement of the analog demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:AM[:RESult?]
PPEak | MPEak | MIDDle | RMS

Example: "CALC:MARK:FUNC:ADEM:AM? PPE"

Features: *RST value: -
SCPI: device-specific

This command is valid only in conjunction with the option Vector Signal Analysis (FSE-B7) and in the analog demodulation mode.

PPEak Result of the measurement with detector +PK
MPEak Result of the measurement with detector -PK
MIDDle Result of averaging ±PK/2
RMS Result of the measurement with detector RMS

In the modulation modes FM or PM query of the MIDDle-result is possible only.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:FM[:RESult?]

This command queries the results of the FM modulation measurement of the analog demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:FM[:RESult?]
PPEak | MPEak | MIDDle | RMS | RDEV

Example: "CALC:MARK:FUNC:ADEM:FM? PPE"

Features: *RST value: -
SCPI: device-specific

This command is valid only in conjunction with the option Vector Signal Analysis (FSE-B7) and in the analog demodulation mode.

PPEak Result of the measurement with detector +PK
MPEak Result of the measurement with detector -PK
MIDDle Result of averaging ±PK/2
RMS Result of the measurement with detector RMS

In the modulation modes FM or PM query of the MIDDle-result is possible only.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:PM[:RESult?]

This command queries the results of the PM modulation measurement of the analog demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:PM[:RESult?]
PPEak | MPEak | MIDDle | RMS

Example: "CALC:MARK:FUNC:ADEM:PM? PPE"

Features: *RST value: -
SCPI: device-specific

This command is valid only in conjunction with the option Vector Signal Analysis (FSE-B7) and in the analog demodulation mode.

PPEak Result of the measurement with detector +PK
MPEak Result of the measurement with detector -PK
MIDDle Result of averaging ±PK/2
RMS Result of the measurement with detector RMS

In the modulation modes FM or PM query of the MIDDle-result is possible only.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:AFRequency[:RESult?]

This command queries the audio frequency of the analog demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:AFRequency[:RESult?]

Example: "CALC:MARK:FUNC:ADEM:AFR? "

Features: *RST value: -
SCPI: device-specific

This command is valid only in conjunction with the option Vector Signal Analysis (FSE-B7) and in the analog demodulation mode.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:FERRor[:RESult?]

This command queries the frequency error of the analog demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:FERRor [:RESult?]

Example: "CALC:MARK:FUNC:ADEM:FERR? "

Features: *RST value: -
SCPI: device-specific

This command is valid only in conjunction with the option Vector Signal Analysis (FSE-B7) and in the analog demodulation mode.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:CARRier[:RESult?]

This command queries the results of the carrier frequency measurement.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:CARRier[:RESult?]

Example: "CALC:MARK:FUNC:ADEM:CARR?"

Features: *RST value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned. It is valid only in the analog demodulation mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad[:STATe]

This command switches the SINAD measurement on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad[:STATe]
ON | OFF

Example: "CALC:MARK:FUNC:ADEM:SIN ON"

Features: *RST value: OFF
SCPI: device-specific

This command is valid only in the analog demodulation mode (option FSE-B7) with Real Time ON.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad:RESult?

This command queries the results of the SINAD measurement.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad:RESult?

Example: "CALC:MARK:FUNC:ADEM:SIN:RES?"

Features: *RST value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned. It is valid only in the analog demodulation mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DDEMod:RESult?

This command queries the error measurement results of digital demodulation.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DDEMod:RESult?
MERM | MEPK | MEPS | PERM | PEPK | PEPS |
EVRM | EVPK | EVPS | IQOF | IQIM | ADR | FERR | RHO

Example: "CALC:MARK:FUNC:DDEM:RES? EVRM"

Features: *RST value: -
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

MERM	magnitude error in %rms	FERR	frequency error in Hz
MEPK	maximum of magnitude error in %pk	FEPK	maximum of frequency error in Hz
MEPS	symbol number by which the maximum of the magnitude error occurred	ADR	amplitude drop in dB/symbol
PERM	phase error in deg	RHO	Rho-Factor
PEPK	maximum of phase error in deg	DEV	FSK deviation in Hz
PEPS	symbol number by which the maximum of the phase error occurred		
EVRM	vector error in %rms	FSPK	maximum of FSK deviation error in Hz
EVPK	maximum of vector error in %pk	FSRM	FSK deviation error in Hz
EVPS	symbol number by which the maximum of the vector error occurred	FSPS	symbol number by which the maximum of error occurred
IQOF	I/Q-offset error in %	DTTS	trigger delay of synchronization
IQIM	I/Q Imbalance in %		

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:SELect

This command selects the power measurement and switches it on.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:SELect
ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0

Example: "CALC:MARK:FUNC:POW:SEL ACP"

Features: *RST value: -
SCPI: device-specific

ACPower	adjacent channel power measurement
CPOWer	channel power measurement
OBANdwidth | OBWidth	occupied bandwidth power measurement
CN	signal / noise power measurement
CN0	signal-/ noise power measurement based on 1Hz bandwidth

This command is an event which is why it is not assigned an *RST value and query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:RESult?

This command queries the results of the power measurement (see also CALCulate:MARKer:FUNCtion:POWer:SELect.)

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:RESult?
ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0

Example: "CALC:MARK:FUNC:POW:RES? OBW"

Features: *RST value: -
SCPI: device-specific

This command is only a query which is why it is not assigned an *RST value.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer[:STATe]

This command switches the power measurement off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer[:STATe] OFF

Example: "CALC:MARK:FUNC:POW OFF"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:PRESet

This command selects the settings for power measurement of standard NADC or of standard TETRA.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:PRESet
NADC | TETRA | PDC | PHS | CDPD | CDMA | NONE

Example: "CALC:MARK:FUNC:POW:PRES NADC"

Features: *RST value: -
SCPI: device-specific

The selection of a standard influences the parameters weighting filter, channel bandwidth and spacing, resolution and video bandwidth, as well as detector and sweep time.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:CFILter

This command switches the weighting filter for the selected standard on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:CFILter ON | OFF

Example: "CALC:MARK:FUNC:POW:CFIL ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MAXimum[:STATe]

This command switches on or off the measurement of the maximum of the absolute value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MAXimum[:STATe]
ON | OFF

Example: "CALC:MARK:FUNC:SUMM:MAX ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MAXimum:RESult?

This command queries the results of the measurement of the maximum of the absolute value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MAXimum:RESult?

Example: "CALC:MARK:FUNC:SUMM:MAX:RES?"

Features: *RST value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned. It is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak[:STATe]

This command switches on or off the measurement of the positive peak value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak[:STATe]
ON | OFF

Example: "CALC:MARK:FUNC:SUMM:PPE ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak:RESult?

This command queries the result of the measurement of the positive peak value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak:RESult?

Example: "CALC:MARK:FUNC:SUMM:PPE:RES?"

Features: *RST value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned. It is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MPEak[:STATe]

This command switches on or off the measurement of the negative peak value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MPEak[:STATe]
ON | OFF

Example: "CALC:MARK:FUNC:SUMM:MPE ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MPEak:RESult?

This command queries the result of the measurement of the negative peak value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MPEak:RESult?

Example: "CALC:MARK:FUNC:SUMM:MPE:RES?"

Features: *RST- value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned. It is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MIDDle[:STATe]

This command switches on or off the measurement of the arithmetical mean between positive and negative peak value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MIDDle[:STATe] ON | OFF

Example: "CALC:MARK:FUNC:SUMM:MIDD ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MIDDle:RESult?

This command queries the result of the measurement of the arithmetical mean between positive and negative peak value.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MIDDle:RESult?

Example: "CALC:MARK:FUNC:SUMM:MIDD:RES? "

Features: *RST- value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned. It is available only in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS[:STATe]

This command switches on or off the measurement of the effective (rms) value of the total trace.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS[:STATe] ON | OFF

Example: "CALC:MARK:FUNC:SUM:RMS ON"

Features: *RST value: OFF
SCPI: device-specific

This command is valid at zero span or in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS:RESult?

This command queries the results of the rms value measurement.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS:RESult?

Example: "CALC:MARK:FUNC:SUM:RMS:RES?"

Features: *RST value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN[:STATe]

This command switches on or off the measurement of the mean value of the total trace.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN[:STATe]
ON | OFF

Example: "CALC:MARK:FUNC:SUMM:MEAN ON"

Features: *RST value: OFF
SCPI: device-specific

This command is valid at zero span or in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN:RESult?

This command queries the result of the measurement of the mean value of the total trace.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN:RESult?

Example: "CALC:MARK:FUNC:SUMM:MEAN:RES?"

Features: *RST- value: -
SCPI: device-specific

This command is only a query and thus has no *RST value assigned.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PHOLd

This command switches on or off the peak-hold function.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PHOLd ON | OFF

Example: "CALC:MARK:FUNC:SUMM:PHOL ON"

Features: *RST value: OFF
SCPI: device-specific

The peak-hold function is reset by switching off and on, again. This command is valid at zero span or in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:AVERage

This command switches the calculation of the average value on or off.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:AVERage ON | OFF

Example: "CALC:MARK:FUNC:SUMM:AVER ON"

Features: *RST value: OFF
SCPI: device-specific

The calculation of the average is reset by switching off and on, again. This command is valid at zero span or in the vector signal analysis mode (option FSE-B7).

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:AOFF

This command switches off all measuring functions.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:AOFF

Example: "CALC:MARK:FUNC:SUMM:AOFF"

Features: *RST value: _
SCPI: device-specific

This command is an "event" and therefore has no *RST value assigned and no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CENTer

This command sets the center frequency to that of the current marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CENTer

Example: "CALC:MARK:FUNC:CENT"

Features: *RST value: -
SCPI: device-specific

This command is an "event" and therefore has no *RST value assigned and no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CSTep

This command sets the step width of the center frequency to the x-value of the current marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CSTep

Example: "CALC:MARK:FUNC:CST"

Features: *RST value: -
SCPI: device-specific

This command is an "event" and therefore has no *RST value assigned and no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STARt

This command sets the start frequency to the frequency of the current marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STARt

Example: "CALC:MARK:FUNC:STAR"

Features: *RST value: -
SCPI: device-specific

This command is an "event" which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STOP

This command sets the stop frequency to the frequency of the current marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STOP

Example: "CALC:MARK:FUNC:STOP"

Features: *RST value: -
SCPI: device-specific

This command is an "event" which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:MSTep

This command sets the marker step width to the x-value of the current marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:MSTep

Example: "CALC:MARK:FUNC:MST"

Features: *RST value: -
SCPI: device-specific

This command is an "event" which is why it is not assigned an *RST value and has no query.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:REFerence

This command sets the reference level to that of the current marker.

Syntax: CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:REFerence

Example: "CALC:MARK:FUNC:REF"

Features: *RST value: -
SCPI: device-specific

This command is an "event" and therefore has no *RST value assigned and no query.

3.6.4.7 CALCulate:MATH Subsystem

The CALCulate:MATH - subsystem allows to process data from the SENSe-subsystem in numeric expressions.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MATH<1 to 4>			
[:EXPRession]			
[:DEFine]	<expr>	--	
:STATe	<Boolean>	--	

CALCulate<1|2>:MATH<1 to 4>[:EXPression][:DEFine]

This command defines the mathematical expression for relating traces and reference line.

Syntax: CALCulate<1|2>:MATH<1 to 4> [:EXPRession][:DEFine]<expr>
<expr>::= 'OP1 - OP2 [+ RLINE]'
OP1 ::= TRACE1 | TRACE2 | TRACE3 | TRACE4
OP2 ::= TRACE1 | TRACE2 | TRACE3 | TRACE4 | RLINE

Examples:
```
"CALC:MATH1 (TRACE1 - TRACE3 + RLINE)"
"CALC:MATH4 (TRACE4 - RLINE)"
```

Features: *RST value: -
SCPI: conforming

The operand [+ RLINE] may be used only if OP2 is different from RLINE. The numeric suffix in CALCULATE<1|2> is not significant. The numeric suffix in MATH<1 to 4> denotes the trace where the result of the mathematical operation is stored. The number must be identical to the number of the operand OP1.

CALCulate<1|2>:MATH<1 to 4>:STATe

This command switches the mathematical relation of traces on or off.

Syntax: CALCulate<1|2>:MATH**<1 to 4>**:STATe ON | OFF

Example:
```
"CALC:MATH1:STAT ON"
```

Features: *RST value: OFF
SCPI: conforming

The numeric suffix in CALCULATE<1|2> is not significant. The numeric suffix in MATH<1 to 4> denotes the trace which the command refers to.

3.6.4.8 CALCulate:UNIT Subsystem

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:X			Vector Signal Analysis
:UNIT			
:TIME	S | SYM		
:UNIT			Vector Signal Analysis
:ANGLe	DEG | RAD		
:POWer	DBM | V | W | DB | PCT | UNITLESS | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ		

CALCulate<1|2>:X:UNIT:TIME

This command selects seconds or symbols as an x-axis unit.

Syntax: CALCulate<1|2>:X:UNIT:TIME S | SYM

Example: "CALC:X:UNIT:TIME S"

Features: *RST value: _S
SCPI: device-specific

This command is only valid in vector signal analysis mode (option FSE-B7).

CALCulate<1|2>: UNIT:ANGLe

This command selects the unit for angular measurement.

Syntax: CALCulate<1|2>:UNIT:ANGLe DEG | RAD

Example: "CALC:UNIT:ANGL DEG"

Features: *RST- value: _RAD
SCPI: device-specific

This command is only valid in vector signal analysis mode (option FSE-B7).

CALCulate<1|2>: UNIT:POWer

This command selects the unit for power.

Syntax: CALCulate<1|2>:UNIT:POWer DBM | V | W | DB |
PCT | UNITLESS |
DBPW | WATT |
DBUV | DBMV | VOLT |
DBUA | AMPere
DBUV_MHZ | DBMV_MHZ |
DBUA_MHZ | DBUV_M | DBUA_M |
DBUV_MMHZ | DBUA_MMHZ

Example: "CALC:UNIT:POW DBM"

Features: *RST value: _
SCPI: device-specific

This command is only valid in vector signal analysis mode (option FSE-B7).

3.6.5 CALibration Subsystem

The commands of the CALibration subsystem perform instrument calibrations.

COMMAND	PARAMETERS	UNIT	COMMENT
CALibration			
[:ALL]?	--	--	query only
:BANDwidth			
[:RESolution]?	--	--	query only
:BWIDth			
[:RESolution]?	--	--	query only
:IQ?	--	--	query only / Vector Signal Analysis
:LDETector?	--	--	query only
:LOSuppression?	--	--	query only
:PPEak?	--	--	query only FSEM/FSEK only
:SHORt?	--	--	query only
:STATe	<Boolean>	--	

CALibration[:ALL]?

This command performs a complete calibration of the analyzer. A "0" is returned if the calibration was successful.

Syntax: CALibration[:ALL]?

Example: `"CAL?"`

Features: *RST value: -
SCPI: conforming

CALibration:BANDwidth | BWIDth[:RESolution]?

This command performs a calibration of the filter bandwidths. A "0" is returned if the calibration was successful.

Syntax: CALibration:BANDwidth|BWIDth[:RESolution]?

Example: `"CAL:BAND?"`

Features: *RST value: -
SCPI: device-specific

CALibration:IQ?

This command performs a calibration of the vector signal analyzer. A "0" is returned if the calibration was successful.

Syntax: CALibration:IQ?

Example: `"CAL:IQ?"`

features: *RST value: -
SCPI: device-specific

This command is valid only when option Vector Signal Analysis FSE-B7 is fitted.

CALibration:LDETector?

This command performs a calibration of the log module's characteristic and of the detectors. A "0" is returned if the calibration was successful.

Syntax: CALibration:LDETector?

Example: "CAL:LDET?"

Features: *RST value: -
SCPI: device-specific

CALibration:LOSuppression?

This command performs a calibration of the local oscillator suppression. . A "0" is returned if the calibration was successful.

Syntax: CALibration:LOSuppression?

Example: "CAL:LOS?"

Features: *RST value: -
SCPI: device-specific

This command is only valid by model '30 instruments or by instruments which have been retrofitted.

CALibration:PPEak?

This command performs a calibration of the tracking YIG filter (preselector peaking). A "0" is returned if the calibration was successful.

Syntax: CALibration:PPEak?

Example: "CAL:PPE?"

Features: *RST value: -
SCPI: device-specific

This command is only valid by the models FSEM and FSEK.

CALibration:SHORt?

This command performs a short calibration. A "0" is returned if the calibration was successful.

Syntax: CALibration:SHORt?

Example: "CAL:SHOR?"

Features: *RST value: -
SCPI: device-specific

CALibration:STATe

This command determines whether (ON) or not (OFF) the current calibration data are taken into consideration.

Syntax: CALibration:STATe ON | OFF

Example: "CAL:STAT OFF"

Features: *RST value: -
SCPI: conforming

3.6.6 CONFigure Subsystem

The CONFigure subsystem contains commands for configuring complex measurement tasks, like those provided by the option GSM BTS Analyzer (FSE-K11). The CONFigure subsystem is closely linked to the functions of the FETCH and READ subsystems, where the measurement cycles are started and/or the results of the measurements are queried.

3.6.6.1 CONFigure:BTS Subsystem

This subsystem provides the commands for configuring the GSM BTS Analyzer mode (Option FSE-K11) for analyzing the behavior of base stations corresponding to the standards P-GSM, E-GSM, DCS1800 or PCS1900.

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:BTS			Option FSE-K11
:ARFCn	<numeric_value>	--	
:AUTO	ONCE		
:POWer			
:CLASs	<numeric_value> | M1 | M2 | M3	--	
:STATic	<numeric_value>	--	
:DYNamic	<numeric_value>	--	
:EXPected	<numeric_value>	DBM	
:CHANnel			
:SLOT	<numeric_value>	--	
:AUTO	ONCE		
:TSC	<numeric_value>	--	
:AUTO	<Boolean>		
:SFH	<Boolean>		
:NETWork			
[:TYPE]	PGSM | EGSM | DCS | PCS		
:PHASe	1|2		
:COSiting	<Boolean>		
:TXSupp	<Boolean>		
:PRESet	--		

CONFigure:BTS:ARFCn

This command selects the number of the transmission channel of the base station.

Syntax: CONFigure:BTS:ARFCn <numeric_value>

<numeric_value>::= 1 to 124 (P-GSM phase I/II)
0 to 124, 975 to 1023 (E-GSM)
512 to 885 (DCS1800 phase I/II)
512 to 810 (PCS1900)

Example: "CONF:BTS:ARFC 67"

Features: *RST value: 1 (P-GSM phase I/II)
0 (E-GSM)
512 (DCS1800 phase I/II)
512 (PCS1900)
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:ARFCn:AUTO

This command is used to search for the channel number of the transmission channel of the base station automatically. This requires only one channel to be active.

Syntax: CONFigure:BTS:ARFCn:AUTO ONCE

Example: "CONF:BTS:ARFC:AUTO ONCE"

Features: *RST value: --
SCPI: device-specific

This command is an event and thus has no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:POWer:CLASs

This command defines the power class of the base station.

Syntax: CONFigure:BTS:POWer:CLASs <numeric_value> | M1 | M2 | M3
<numeric_value> ::= 1 to 8 (P-GSM phase I/II, E-GSM, DCS1800 phase I/II)
::= 1 to 4 (PCS1900)
M1, M2, M3 ::= Power Classes for Micro BTS

Example: "CONF:BTS:POW:CLAS 4"

Features: *RST value: 4 (P-GSM phase I/II, E-GSM)
1 (DCS1800, PCS1900)
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:POWer:STATic

This command defines the static power control level of the base station.

Syntax: CONFigure:BTS:POWer:STATic <numeric_value>
<numeric_value>::= 0 to 6

Example: "CONF:BTS:POW:STAT 3"

Features: *RST value: 0
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:POWer:DYNamic

This command defines the dynamic power control level of the base station.

Syntax: CONFigure:BTS:POWer:DYNamic <numeric_value>
<numeric_value>::= 0 to 15

Example: "CONF:BTS:POW:DYN 5"

Features: *RST value: 0
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:POWer:EXPected

This command enters directly the rated output level of the base station specified by the manufacturer.

Syntax: CONFigure:BTS:POWer:EXPected <numeric_value>

Example: "CONF:BTS:POW:EXP 43DBM"

Features: *RST value: 46 dBm (P-GSM phase I/II, E-GSM)
43 dBm (DCS1800, PCS1900)
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:CHANnel:SLOT

This command selects the slot number within a transmission frame of the base station.

Syntax: CONFigure:BTS:CHANnel:SLOT <numeric_value>
<numeric_value> ::= 0 to 7

Example: "CONF:BTS:CHAN:SLOT 3"

Features: *RST value: 0
SCPI: device-specific

On changing the slot number, the number of the midamble (TSC) is automatically adapted to the slot. This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:CHANnel:SLOT:AUTO

This command automatically searches for the slot number within a transmission frame of the base station. This requires only one slot to be active.

Syntax: CONFigure:BTS:CHANnel:SLOT:AUTO ONCE

Example: "CONF:BTS:CHAN:SLOT:AUTO ONCE"

Features: *RST value: --
SCPI: device-specific

This command is an event and thus has no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:CHANnel:SFH

This command defines whether the base station uses slow frequency hopping or not.

Syntax: CONFigure:BTS:CHANnel:SFH ON | OFF

Example: "CONF:BTS:CHAN:SFH ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only when spurious or transient spectrum measurement is selected. The settings for spurious measurement are independent from those selected for transient spectrum. Moreover, this command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:CHANnel:TSC:AUTO

This command couples the midamble (training sequence TSC_0 to 7) to the slot, i.e. if the slot number is changed the training sequence in the ON state is automatically adapted. In the OFF state, the training sequence set is conserved even if the slot number is changed.

Syntax: CONFigure:BTS:CHANnel:TSC:AUTO ON | OFF

Example: "CONF:BTS:CHAN:TSC:AUTO ON"

Features: *RST value: ON
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:CHANnel:TSC

This command selects the midamble (training sequence TSC_0 to 7) of the active slot.

Syntax: CONFigure:BTS:CHANnel:TSC <numeric_value>
<numeric_value> ::= 0 to 7

Example: "CONF:BTS:CHAN:TSC 3"

Features: *RST value: 0
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:NETWork[:TYPE]

This command selects the standard type according to which the base station will work.

Syntax: CONFigure:BTS:NETWork[:TYPE]PGSM | EGSM | DCS | PCS

Example: "CONF:BTS:NETW DCS"

Features: *RST value: GSM
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:NETWork:PHASe

This command selects the phase of the standard according to which the base station will work.

Syntax: CONFigure:BTS:NETWork:PHASe1|2

Example: "CONF:BTS:NETW:PHAS 2"

Features: *RST value: 1
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:COSiting

This command selects whether the base station has the "cositing" feature.

Syntax: CONFigure:BTS:COSiting ON | OFF

Example: "CONF:BTS:COSiting ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only if spurious emission measurement is selected. Moreover, it is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:TXSupp

This command defines that an additional carrier suppression of min. 20dB is taken into account for the measurement. If there is already suppression, a more sensitive setting of the instrument is selected.

Syntax: CONFigure:BTS:TXSupp ON | OFF

Example: "CONF:BTS:TXSupp ON"

Features: *RST value: OFF
SCPI: device-specific

For measurements in the RX-band the value is automatically set to ON. This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:BTS:PRESet

This command resets the parameters for the standard selected to their default values (DEFAULT SETTINGS).

Syntax: CONFigure:BTS:PRESet

Example: "CONF:BTS:PRES"

Features: *RST value: --
SCPI: device-specific

This command is an event and has thus no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

3.6.6.2 CONFigure:BURSt Subsystem

This subsystem provides the commands for configuring the measurements in the GSM BTS Analyzer mode (option FSE-K11) or GSM MS Analyzer mode (option FSE-K10) which are performed on individual bursts. (carrier power, phase/frequency error, power vs. time).

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:BURSt			
:PFERror			Option FSE-K11&FSE-B7 or FSE-K10&FSE-B7
[:IMMediate]	--	--	
:COUNt	<numeric_value>	--	
:POWer			
[:IMMediate]	--	--	Option FSE-K11 or FSE-K10
:COUNt	<numeric_value>	--	
:CONDition	NORMal | EXTReme		
:PTEMplate			
[:IMMediate]	--	--	Option FSE-K11 or FSE-K10
:COUNt	<numeric_value>	--	
:SELect	FULL | TOP | RISing | FALLing		

CONFigure:BURSt:PFERror[:IMMediate]

This command selects measurement of the phase and frequency error of the base station or mobile.

Syntax: CONFigure: BURSt:PFERror[:IMMediate]

Example: "CONF:BURST:PFER"

Features: *RST value: --
SCPI: device-specific

This command is an event and thus has no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer FSE-K11 and Vector Signal Analysis FSE-B7 or in conjunction with option GSM MS Analyzer, FSE-K10, and Vector Signal Analysis, FSE-B7.

CONFigure:BURSt:PFERror:COUNt

This command sets the number of bursts used for the determination of average and maximum value.

Syntax: CONFigure: BURSt:PFERror:COUNt <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:BURST:PFER:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 Phase I)
200 otherwise
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer FSE-K11 or GSM MS Analyzer FSE-K10 and Vector Signal Analysis FSE-B7.

CONFigure:BURSt:POWer[:IMMediate]

This command selects measurement of the average carrier power of the base station or mobile.

Syntax: CONFigure: BURSt:POWer[:IMMediate]

Example: "CONF:BURST:POW"

Features: *RST value: --
SCPI: device-specific

This command is an event and thus has no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:BURSt:POWer:COUNt

This command sets the number of bursts used for the determination of measured values.

Syntax: CONFigure: BURSt:POWer:COUNt <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:BURST:POW:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 phase I)
200 otherwise
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:BURSt:POWer:CONDition

This command defines the conditions for power measurement.

Syntax: CONFigure: BURSt:POWer:CONDition NORMal | EXTReme

Example: "CONF:BURST:POW:COND EXTR"

Features: *RST value: NORMal
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:BURSt:PTEMplate[:IMMediate]

This command selects measurement of power of the base station or mobile vs. time.

Syntax: CONFigure: BURSt:PTEMplate[:IMMediate]

Example: "CONF:BURST:PTEM"

Features: *RST value: --
SCPI: device-specific

This command is an event and thus has no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:BURSt:PTEMPlate:COUNt

This command defines the number of bursts used for determining the measured value.

Syntax: CONFigure: BURSt:PTEMplate:COUNt <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:BURS:PTEM:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 phase I)
200 otherwise
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:BURSt:PTEMplate:SELect

This command defined the burst section to be measured.

Syntax: CONFigure: BURSt:PTEMplate:SELect FULL | TOP | RISing | FALLing

Example: "CONF:BURS:PTEM:SEL TOP"

Features: *RST value: FULL
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

3.6.6.3 CONFigure:MS Subsystem

This subsystem provides the commands for configuring the GSM MS Analyzer mode (Option FSE-K10) for analyzing the behavior of mobiles corresponding to the standards P-GSM, E-GSM, DCS1800 or PCS1900.

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:MS			Option FSE-K10
:ARFCn	<numeric_value>	--	
:AUTO	ONCE		
:POWer			
:CLASs	<numeric_value>	--	
:LEVel	<numeric_value>	--	
:EXPected	<numeric_value>	DBM	
:CHANnel			
:TSC	0 to 7	--	
:NETWork			
[:TYPE]	PGSM | EGSM | DCS | PCS		
:PHASe	1|2		
:TXSupp	<Boolean>		
:PRESet	--		

CONFigure:MS:ARFCn

This command selects the number of the transmission channel of the mobile.

Syntax: CONFigure:MS:ARFCn <numeric_value>

<numeric_value>::= 1 to 124 (P-GSM phase I/II)
0 to 124, 975 to 1023 (E-GSM)
512 to 885 (DCS1800 phase I/II)
512 to 810 (PCS1900)

Example: "CONF:MS:ARFC 67"

Features: *RST value: 1 (P-GSM phase I/II)
0 (E-GSM)
512 (DCS1800 phase I/II)
512 (PCS1900)
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:ARFCn:AUTO

This command selects automatically the transmission channel of the mobile.

Syntax: CONFigure:MS:ARFCn:AUTO ONCE

Example: "CONF:MS:ARFC:AUTO ONCE"

Features: *RST value: -
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:POWer:CLASs

This command defines the power class of the mobile.

Syntax: CONFigure:MS:POWer:CLASs <numeric_value>
<numeric_value> ::= 1 to 5 (P-GSM phase I)
2 to 5 (P-GSM phase II)
2 to 5 (E-GSM)
1 to 2 (DCS1800 phase I)
1 to 3 (DCS1800 phase II)
1 to 3 (PCS1900)

Example: "CONF:MS:POW:CLAS 4"

Features: *RST value: 2 (P-GSM phase I/II, E-GSM)
1 (DCS1800, PCS1900)
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:POWer:LEVel

This command defines the power control level of the mobile.

Syntax: CONFigure:MS:POWer:LEVel <numeric_value>
<numeric_value>::= 0 to 6

Example: "CONF:MS:POW:LEV 3"

Features: *RST value: 0
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:POWer:EXPected

This command enters directly the rated output level of the mobile.

Syntax: CONFigure:MS:POWer:EXPected <numeric_value>

Example: "CONF:MS:POW:EXP 43DBM"

Features: *RST value: 46 dBm (P-GSM phase I/II, E-GSM)
43 dBm (DCS1800, PCS1900)
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:CHANnel:TSC

This command selects the midamble used by the mobile.

Syntax: CONFigure:MS:CHANnel:TSC <numeric_value> | AB
<numeric_value> ::= 0 to 7 (training sequence for the Normal Burst)

Example: "CONF:MS:CHAN:TSC 3"

Features: *RST value: 0
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:NETWork[:TYPE]

This command selects the standard type according to which the mobile will work.

Syntax: CONFigure:MS:NETWork[:TYPE] PGSM | EGSM | DCS | PCS

Example: "CONF:MS:NETW DCS"

Features: *RST value: GSM
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:NETWork:PHASe

This command selects the phase of the standard according to which the mobile will work.

Syntax: CONFigure:MS:NETWork:PHASe 1 | 2

Example: "CONF:MS:NETW:PHAS 2"

Features: *RST value: 1
SCPI: device-specific

This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:TXSupp

This command defines that an additional carrier suppression of min. 20dB is taken into account for the measurement. If there is already suppression, a more sensitive setting of the instrument is selected.

Syntax: CONFigure:MS:TXSupp ON | OFF

Example: "CONF:MS:TXSupp ON"

Features: *RST value: OFF
SCPI: device-specific

For measurements in the RX-band the value is automatically set to ON. This command is available only in conjunction with option GSM MS Analyzer, FSE-K10.

CONFigure:MS:PRESet

This command resets the parameters for the standard selected to their default values (DEFAULT SETTINGS).

Syntax: CONFigure:MS:PRESet

Example: "CONF:MS:PRES"

Features: *RST value: –
SCPI: device-specific

This command is an event and has thus no query and no *RST value assigned. It is available only in conjunction with option GSM MS Analyzer, FSE-K10.

3.6.6.4 CONFigure:SPECtrum Subsystem

This subsystem provides the commands for configuring the measurements in the GSM BTS Analyzer mode (FSE-K11) or in the GSM MS Analyzer mode (FSE-K10) used to determine the power of the spectral contributions due to modulation and switching (modulation spectrum, transient spectrum).

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:SPECtrum			Option FSE-K11 or FSE-K10
:MODulation			
[:IMMediate]	--	--	
:COUNt	<numeric_value>	--	
:RANGe	ARFCn | TXBand | RXBand | COMBined | DCSRx1800		
:SWITching			
[:IMMediate]	--	--	
:COUNt	<numeric_value>	--	

CONFigure:SPECtrum:MODulation[:IMMediate]

This command selects measurement of the spectrum due to modulation.

Syntax: CONFigure:SPECtrum:MODulation[:IMMediate]

Example: "CONF:SPEC:MOD"

Features: *RST value: --
SCPI: device-specific

This command is an event and has thus no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:SPECtrum:MODulation:COUNt

This command sets the number of bursts used for determining the average and maximum values.

Syntax: CONFigure:SPECtrum:MODulation:COUNt <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:SPEC:MOD:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 phase I)
200 otherwise
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:SPECtrum:MODulation:RANGe

This command selects the frequency range for the measurement.

Syntax: CONFigure:SPECtrum:MODulation:RANGe ARFCn | TXBand | RXBand | COMBined | DCSRx1800
ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-Band
RXBand::= RX-Band
COMBined::= ARFCN ± 1.8 MHz / TX-Band
DCSRx1800::= RX band DCS 1800 (option FSE-K10 only)

Example: "CONF:SPEC:MOD:RANG TXB"

Features: *RST value: ARFCn
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:SPECtrum:SWITching[:IMMediate]

This command selects measurement of the spectrum due to switching transients.

Syntax: CONFigure:SPECtrum:SWITching[:IMMediate]

Example: "CONF:SPEC:SWIT "

Features: *RST value: --
SCPI: device-specific

This command is an event and has thus no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:SPECtrum:SWITching:COUNt

This command defines the number of bursts used for determining the average and maximum values.

Syntax: CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:SPEC:SWIT:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 phase I)
200 otherwise
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

3.6.6.5 CONFigure:SPURious Subsystem

This subsystem provides commands for configuring the measurements in the GSM BTS (FSE-K11) or GSM MS (FSE-K10) Analyzer mode used for measuring the power of spurious emissions.

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:SPURious			Option FSE-K11 or FSE-K10
[:IMMediate]	--	--	
:COUNt	<numeric_value>	--	
:RXBand	<numeric_value>	--	
:RANGe	TXBand | OTXBand | RXBand | IDLeband	--	

CONFigure:SPURious[:IMMediate]

This command selects measurement of spurious emissions.

Syntax: CONFigure:SPURious[:IMMediate]

Example: "CONF:SPUR"

Features: *RST value: --
SCPI: device-specific

This command is an event and has thus no query and no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

CONFigure:SPURious:COUNt

This command sets the number of bursts used for determining the average and maximum values.

Syntax: CONFigure:SPURious:COUNt <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:SPUR:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 phase I)
200 otherwise
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.
The number of bursts in measurements of the RX band is set by command CONFigure:SPURious:RANGe:RXBand (FSE K11 only).

CONFigure:SPURious:COUNt:RXBand

This command ses the number of bursts used for determining the average and maximum values in measurements of the RX band.

Syntax: CONFigure:SPURious:COUNt:RXBand <numeric_value>
<numeric_value>::= 1 to 1000

Example: "CONF:SPUR:COUN:RXB 100"

Features: *RST value: 1
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11.

CONFigure:SPURious:RANGe

This command selects the frequency range used for the measurement.

Syntax: CONFigure:SPURious:RANGe TXBand | OTXBand | RXBand
TXBand::= TX-Band
OTXBand::= Not TX-Band
RXBand::= RX-Band (option FSE-K11 only)
IDLeband::= Idle band (option FSE-K10 only)

Example: "CONF:SPUR:RANG OTX"

Features: *RST value: TXB
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

3.6.7 DIAGnostic Subsystem

The DIAGnostic subsystem contains the commands which support instrument diagnostics for maintenance, service and repair. In accordance with the SCPI standard, all of these commands are device-specific.

COMMAND	PARAMETERS	UNIT	COMMENT
DIAGnostic			
:SERVice			
:INPut			
[:SELect]	CALibration | RF	--	
:FUNCtion	<numeric_value>,>numeric_value>	--	no query
:NSOurce	<Boolean>	--	

DIAGnostic:SERVice:INPut[:SELect]

This command toggles between the RF input on the front panel and the internal 120-MHz reference signal.

Syntax: DIAGnostic:SERVice:INPut[:SELect] CALibration|RF

Example: `"DIAG:SERV:INP CAL"`

Features: *RST value: RF
SCPI: device-specific

DIAGnostic:SERVice:FUNCtion

This command activates a service function.

Syntax: DIAGnostic:SERVice:FUNCtion <numeric_value>,<numeric_value>...

Example: `"DIAG:SERV:FUNC 2,0,2,12,1"`

Features: *RST value: -
SCPI: device-specific

The service function is selected via five parameters: functional group number, board number, function number, parameter 1 and parameter 2.

See service manual 1065.6016.24.

DIAGnostic:SERVice:NSOurce

This command switches the 28-V supply at the rear connector of the noise source on and off.

Syntax: DIAGnostic:SERVice:NSOurce ON | OFF

Example: `"DIAG:SERV:NSO ON"`

Features: *RST value: OFF
SCPI: device-specific

3.6.8 DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of trace data on the display.
The displays in the split-screen mode are assigned to WINDow 1 (screen A) or 2 (screen B) .

COMMAND	PARAMETERS	UNIT	COMMENT
DISPlay			
:FORMat	SINGle | SPLit		
:PROgram			
[:MODE]	<Boolean>		option FSE-B15
:ANNotation			
:FREQuency	<Boolean>		
:LOGO	<Boolean>		
:CMAP<1 to 13>			
:DEFault			
:HSL	0 to 1,0 to 1,0 to 1		
:PDEFined	BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta		
[:WINDow<1|2>]			
:TEXT			
[:DATA]	<string>		
:STATe	<Boolean>		
:TIME	<Boolean>		
:MINFo	<Boolean>		
:TRACe<1 to 4>			
:X			
[:SCALe]			Vector Signal Analysis
:RVALue	<numeric_value>		
:ZOOM	<Boolean>		
[:FREQuency]			
:STARt	<numeric_value>	HZ	
:STOP	<numeric_value>	HZ	
:CENTer	<numeric_value>	HZ	
:Y			
[:SCALe]	<numeric_value>	DB	
:MODE	ABSolute | RELative		
:RLEVel	<numeric_value>	DBM	
:OFFSet	<numeric_value>	DB	
:RVALue	<numeric_value>	DBM|DB|HZ| DEG|RAD	Vector Signal Analysis
:AUTO	<Boolean>		Analyzer mode only
:RPOSition	<numeric_value>	PCT	Vector Signal Analysis
:PDIVision	<numeric_value>	DBM|DB|HZ| DEG|RAD	Vector Signal Analysis
:SPACing	LINear|LOGarithmic|PERCent	--	
:MODE	WRITe | VIEW | AVERage | MAXHold | MINHold	--	
:CWRite	<Boolean>	--	Vector Signal Analysis
:ANALog	<Boolean>	--	
:HCONtinuous	<Boolean>	--	
[:STATe]	<Boolean>	--	
:SYMBol	DOTS | BARS | OFF		Vector Signal Analysis
:EYE			
COUNt	<numeric_value>	SYM	Vector Signal Analysis

DISPlay:FORMat

This command switches the test result display between FULL SCREEN and SPLIT SCREEN.

Syntax: DISPlay:FORmat SINGle | SPLit

Example: "DISP:FORM SPL"

Features: *RST value: SINGle
SCPI: device-specific

DISPlay:PROGram[:MODE]

This command switches the display between the measuring instrument and the computer function.

Syntax: DISPlay:PROGram[:MODE] ON | OFF

Example: "DISP:PROG ON"

Features: *RST value: OFF
SCPI: device-specific

This command is only valid in conjunction with Option Computer Function (FSE-B15).

DISPlay:ANNotation:FREQuency

This command switches the x-axis annotation on or off.

Syntax: DISPlay:ANNotation:FREQuency ON | OFF

Example: "DISP:ANN:FREQ OFF"

Features: *RST value: ON
SCPI: conforming

DISPlay:LOGO

This command switches the factory logo on the screen on or off.

Syntax: DISPlay:LOGO ON | OFF

Example: "DISP:LOGO OFF"

Features: *RST value: ON
SCPI: device-specific

DISPlay:CMAP<1 to 13>:DEFault

This command resets the screen colors of the instrument to their default settings.

Syntax: DISPlay:CMAP<1 to 13>:DEFault

Example: "DISP:CMAP:DEF"

Features: *RST value: --
SCPI: conforming

This command is an event and has thus no query and no *RST value assigned. The numeric suffix in CMAP<1 to 13> is not significant.

DISPlay:CMAP<1 to 13>:HSL

This command defines the color table of the instrument. To each numeric suffix of CMAP is assigned one or several picture elements which can be modified by varying the corresponding color setting. The following assignment applies:

CMAP1	Trace 1	CMAP8	Softkey State Data Entry
CMAP2	Trace 2	CMAP9	Softkey State OFF
CMAP3	Trace 3	CMAP10	Softkey Shade
CMAP4	Trace 4	CMAP11	Text
CMAP5	Marker	CMAP12	Title
CMAP6	Grid	CMAP13	Background
CMAP7	Softkey State On		

Syntax: DISPlay:CMAP<1 to 13>:HSL <hue>,<sat>,<lum>
hue = TINT
sat = SATURATION
lum = BRIGHTNESS

The value range is 0 to 1 for all parameters.

Example: `"DISP:CMAP2:HSL 0.3,0.8,1.0"`

Features: *RST value: --
SCPI: conforming

The values set are not changed by *RST.

DISPlay:CMAP<1 to 13>:PDEFined

This command defines the color table of the instrument using predefined color values. To each numeric suffix of CMAP is assigned one or several picture elements which can be modified by varying the corresponding color setting. The same assignment as for `DISPlay:CMAP<1 to 13>:HSL` applies.

Syntax: DISPlay:CMAP<1 to 13>:PDEFined BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta

Example: `"DISP:CMAP2:PDEF GRE"`

Features: *RST value: --
SCPI: conforming

The values set are not changed by *RST.

DISPlay[:WINDow<1|2>]:MINFo

This command switches the marker info list on the screen on or off.

Syntax: DISPlay[:WINDow<1|2>]:MINFo ON | OFF

Example: `"DISP:MINF ON"`

Features: *RST value: OFF
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TEXT[:DATA]

This command defines a comment which can be displayed on the screen.

Syntax: DISPlay[:WINDow<1|2>]:TEXT[:DATA] <string>

Example: "DISP:TEXT "signal/noise power measurement"

Features: *RST value: "" (empty)
SCPI: conforming

The numeric suffix in WINDow<1|2> is not significant.

DISPlay[:WINDow<1|2>]:TEXT:STATe

This command switches on or off the screen display of the comment.

Syntax: DISPlay[:WINDow<1|2>]:TEXT:STATe ON | OFF

Example: "DISP:TEXT:STAT ON"

Features: *RST value: OFF
SCPI: conforming

The numeric suffix in WINDow<1|2> is not significant.

DISPlay[:WINDow<1|2>]:TIME

This command switches on or off the screen display of date and time.

Syntax: DISPlay[:WINDow<1|2>]:TIME ON | OFF

Example: "DISP:TIME ON"

Features: *RST value: OFF
SCPI: device-specific

The numeric suffix in WINDow<1|2> is not significant.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:RVALue

This command defines the reference value for the X-axis of the measuring diagram.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:RVALue <numeric_value>

Example: "DISP:TRAC:X:RVAL 20SYM"

Features: *RST value: -
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM

This command displays the zoomed current frequency range in the opposite window of the split screen representation.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM ON | OFF

Example: "DISP:TRAC:X:ZOOM ON"

Features: *RST value: OFF
SCPI: device-specific

The numeric suffix in TRACe<1 to 4> is not significant.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM[:FREQuency]:STARt

This command defines the start frequency of the zoomed display range. The value must lie between start and stop frequency of the original range.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM[:FREQuency]:STARt <numeric_value>

Example: "DISP:TRAC:X:ZOOM:STAR 100MHZ"

Features: *RST value: -- (depending on the current frequency setting)
SCPI: device-specific

The numeric suffix in TRACe<1 to 4> is not significant.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM[:FREQuency]:STOP

This command defines the stop frequency of the zoomed display range. The value must lie between start and stop frequency of the original range.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM[:FREQuency]:STOP <numeric_value>

Example: "DISP:TRAC:X:ZOOM:STOP 200MHZ"

Features: *RST value: -- (depending on the current frequency setting)
SCPI: device-specific

The numeric suffix in TRACe<1 to 4> is not significant.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM[:FREQuency]:CENTer

This command shifts the zoomed frequency range to the specified center frequency.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:X[:SCALe]:ZOOM[:FREQuency]:CENTer <numeric_value>

Example: "DISP:TRAC:X:ZOOM:CENT 1GHZ"

Features: *RST value: -- (depending on the current frequency setting)
SCPI: device-specific

The numeric suffix in TRACe<1 to 4> is not significant.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]

This command defines the display range of the Y-axis (level axis) with logarithmic scaling (DISP:TRAC:Y:SPAC LOG).

Syntax: DISPlay[:WINDow<1|2>:TRACe<1 to 4>:Y[:SCALe] <numeric_value>
<numeric_value>::= 10dB to 200dB

Example: "DISP:TRAC:Y 110dB"

Features: *RST value: 100dB
SCPI: device-specific

For linear scaling, (DISP:TRAC:Y:SPAC LIN | PERC) the display range is fixed and cannot be set.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:MODE

This command defines the scale of the y-axis (absolute or relative).

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:MODE ABSolute | RELative

Example: "DISP:TRAC:Y:MODE REL"

Features: *RST value: ABS
SCPI: device-specific

As long as SYSTem:DISPlay is set to OFF, this command does not directly influence the screen.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RLEVel

This command defines the reference level.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RLEVel <numeric_value>
<numeric_value>::= -200dBm to 200dBm

Example: "DISP:TRAC:Y:RLEV -60dBm"

Features: *RST value: -20dBm
SCPI: conforming

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RLEVel:OFFSet

This command defines the offset of the reference level.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RLEVel:OFFSet <numeric_value>
<numeric_value>::= -200dB to 200dB

Example: "DISP:TRAC:Y:RLEV:OFFS -10dB"

Features: *RST value: 0dB
SCPI: conforming

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RVALue

This command defines the reference value for the y-axis of the measurement diagram.
This defines the upper limit of the display range, the corresponding parameters of the manual control vary according to the measurement mode.

In the signal analysis mode the setting corresponds to the parameter MAX LEVEL

In the vector signal analysis mode the setting corresponds to the parameter REFERENCE VALUE Y AXIS.

IF option FSE-B8 to B11 (tracking generator) is fitted and the normalization in the analyzer mode is activated, the value corresponds to the parameter REFERENCE VALUE.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RVALue <numeric_value>

Example:
"DISP:TRAC:Y:RVAL -20dBm" (signal analysis)
"DISP:TRAC:Y:RVAL +1.20" (vector signal analysis)
"DISP:TRAC:Y:RVAL 0" (tracking generator)

Features: *RST value: - coupled to reference level
0 (vector signal analysis)
0 dB (tracking generator with active normalization)
SCPI: device specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RVALue:AUTO

This command defines whether the reference value for the y-axis of the measured diagram is coupled to the reference level (default) or can be set independently.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RVALue:AUTO ON | OFF

Example: "DISP:TRAC:Y:RVAL:AUTO ON"

Features: *RST value: ON
SCPI: device-specific

This command is available in the analyzer mode only.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RPOSition

This command defines the position of the reference value.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:RPOSition 0 to 100PCT

Example: "DISP:TRAC:Y:RPOS 50PCT"

Features: *RST value: 100PCT (FSE-B8 to B11)
50PCT (FSE-B7)
SCPI: conforming

This command is only valid in conjunction with option FSE-B7, Vector Signal Analysis, or option FSE-B8 to B11, Tracking Generator.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:PDIVision

This command defines the scaling of the Y-axis in the current unit.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y[:SCALe]:PDIVision <numeric_value>

Example: "DISP:TRAC:Y:PDIV +1.20" (FSE-B7)
"DISP:TRAC:Y:PDIV 0 dB" (FSE-B8)

Features: *RST value: -
SCPI: conforming

This command is only valid in conjunction with option FSE-B7, Vector Signal Analysis, and option FSE-B8 to B11, Tracking Generator.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y:SPACing

This command toggles between linear and logarithmic display.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:Y:SPACing
LINear | LOGarithmic | PERCent

Example: "DISP:TRAC:Y:SPAC LIN"

Features: *RST value: LOGarithmic
SCPI: conforming

The linear display can be LIN/% (PERCent) or LIN/dB (LINear).

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE

This command defines the type of display and the evaluation of the traces.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE
WRITe | VIEW | AVERage | MAXHold | MINHold

Example: "DISP:TRAC3:MODE MAXH"

Features: *RST value: WRITe for TRACe1, STATe OFF for TRACe2 to 4
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE:CWRite

This command selects continuous display of the measured values (continuous write).

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE:CWRite ON | OFF

Example: "DISP:TRAC3:MODE:CWR ON"

Features: *RST value: OFF
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE:ANALog

This command selects continuous display of the measured values in the analyzer mode (analog trace).

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE:ANALog ON | OFF

Example: "DISP:TRAC3:MODE:ANAL ON"

Features: *RST value: OFF
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE:HCONtinuous

This command defines whether the traces in the min hold/max hold mode are reset after some definite parameter changes.

OFF The traces are reset after some definite parameter changes.

ON This mechanism is switched off.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:MODE:HCONtinuous ON | OFF

Example: "DISP:TRAC3:MODE:HCON ON"

Features: *RST value: OFF
SCPI: device-specific

In general, parameter changes require a restart of the measurement before results are evaluated (e. g. with markers). For those changes that are known to require a new measurement (e. g. modification of the span), the trace is automatically reset so that erroneous evaluations of previous results are avoided. This mechanism can be switched off for those exceptional cases where the described behavior is unwelcome.

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:SYMBol

This command determines the display of the points of decision on the trace.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:SYMBol DOTS | BARS | OFF

Example: "DISP:TRAC:SYMB BARS"

Features: *RST value: OFF
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:EYE:COUNt

This command determines the display range of the eye diagram in symbols.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>:EYE:COUNt <numeric_value>
<numeric_value> ::= 1 **to** Result Length

Example: "DISP:TRAC:EYE:COUNt 5"

Features: *RST value: 2
SCPI: device-specific

This command is available only in the vector signal analysis mode (option FSE-B7).

DISPlay[:WINDow<1|2>]:TRACe<1 to 4>[:STATe]

This command switches the display of the corresponding trace on or off.

Syntax: DISPlay[:WINDow<1|2>]:TRACe<1 to 4>[:STATe] ON | OFF

Example: "DISP:TRAC3 ON"

Features: *RST value: ON for TRACe1, OFF for TRACe2 to 4
SCPI: conforming

This command is available only in the vector signal analysis mode (option FSE-B7).

3.6.9 FETCh Subsystem

The FETCh subsystem contains commands for reading out results of complex measurement tasks like those provided by options GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10. The FETCh-subsystem is closely linked to the functions of the CONFigure and READ-subsystems, where the measurement sequences are configured, the measurements are started and their results are queried.

3.6.9.1 FETCh:BURSt Subsystem

This subsystem provides the commands for reading out results of measurements in the GSM BTS (option FSE-K11) or GSM MS (option FSE-K10) Analyzer mode, which are performed on individual bursts (Carrier Power, Phase/Frequency Error) without starting the measurement by themselves.

COMMAND	PARAMETERS	UNIT	COMMENT
FETCh			Option FSE-K11 or FSE-K10
:BURSt			
:PERRor			
:RMS			
:AVERage?	--		
:MAXimum?	--		
:PEAK			
:AVERage?	--		
:MAXimum?	--		
:FERRor			
:AVERage?	--		
:MAXimum?	--		
:POWer	--		
[:IMMediate?]	--		
:ALL?	--		

FETCh:BURSt:PERRor:RMS:AVERage?

This command reads out the average of the RMS-measurement of the phase error taken over the selected number of bursts.

Syntax: FETCh:BURSt:PERRor:RMS:AVERage?

Example: "FETC:BURS:PERR:RMS:AVER?"

Features: *RST value: --
SCPI: device-specific

This command is a query and has therefore no *RST value assigned.
It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and when measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:PERRor:RMS:MAXimum?

This command reads out the maximum of the RMS-measurement of the phase error for the selected number of bursts.

Syntax: FETCh:BURSt:PERRor:RMS:MAXimum?

Example: "FETC:BURS:PERR:RMS:MAX?"

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:PERRor:PEAK:AVERage?

This command reads out the average of the peak measurement of the phase error taken over the selected number of bursts.

Syntax: FETCh:BURSt:PERRor:PEAK:AVERage?

Example: "FETC:BURS:PERR:PEAK:AVER?"

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:PERRor:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the phase error for the selected number of bursts.

Syntax: FETCh:BURSt:PERRor:PEAK:MAXimum?

Example: "FETCh:BURS:PERR:PEAK:MAX?"

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:FERRor:AVERage?

This command reads out the average of the measurement of the frequency error taken over the selected number of bursts.

Syntax: FETCh:BURSt:FERRor:AVERage?

Example: "FETCh:BURS:FERR:AVER?"

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:FERRor:MAXimum?

This command reads out the maximum frequency error measured over the selected number of bursts.

Syntax: FETCh:BURSt:FERRor:MAXimum?

Example: "FETCh:BURS:FERR:MAX?"

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:POWer[:IMMediate?]

This command reads out the result of the last step performed during the measurement of the output power of the base station or mobile.

Syntax: FETCh:BURSt:POWer[:IMMediate]?

The result is output as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>,
<Delta>,<Status>

with

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	Rated value for the current power control level acc. to standard dBm
<Act-Level>:	measured power in dBm
<Delta>:	Difference between the measured power and the power at the previous static/dynamic power control level.
<Status>:	Result of limit check in character data form: PASSED no limits exceeded FAILED limit exceeded

Example: "FETC:BURS:POW?"
Result: 0,0,43,44.1,0,PASSED

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

FETCh:BURSt:POWer:ALL?

This command reads out the results of all individual steps during the measurement of the output power of the base station or mobile.

Syntax: FETCh:BURSt:POWer:ALL?

The result is output as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>,
<Delta>,<Status>

with

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	Rated value for the current power control level acc. to standard dBm
<Act-Level>:	measured power in dBm
<Delta>:	Difference between the measured power and the power at the previous static/dynamic power control level.
<Status>:	Result of limit check in character data form: PASSED no limits exceeded FAILED limit exceeded

Example: "FETC:BURS:POW:ALL?"
Result:
0,0,43,44.1,0,PASSED,1,0,41,42.5,1.6,PASSED,1,1,35,32.5,5.6,FAILED

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

3.6.9.2 FETCh:SPECtrum Subsystem

This subsystem provides the commands for reading out results of measurements in the GSM BTS (FSE-K11) or GSM MS (FSE-K10) Analyzer mode, used to measure the power of the spectral contributions due to modulation and switching (modulation spectrum, transient spectrum) without first restarting a new measurement.

COMMAND	PARAMETERS	UNIT	COMMENT
FETCh			Option FSE-K11 or FSE-K10
:SPECtrum			
:MODulation			
[:ALL?]	ARFCn | TXBand | RXBand | COMBined | DCSRx1800		
:SWITching			
[:ALL?]	--		

FETCh:SPECtrum:MODulation[:ALL]?

This command reads out the result of the measurement of the modulation spectrum of the base station or mobile.

Syntax: FETCh:SPECtrum:MODulation[:ALL]? ARFCn | TXBand | RXBand | COMBined | DCSRx1800

ARFCn::= ARFCN ± 1.8 MHz
TXBand::= TX-Band
RXBand::= RX-Band
COMBined::= ARFCN ± 1.8 MHz / TX-Band (option FSE-K11 only)
DCSRx1800::= RX band DCS 1800 (option FSE-K10 only)

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status> [,
<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status>]...

where the parts between '[...]' denote a partial result string that can be repeated n times.

<Index>: 0, if the partial result string characterizes a measurement range current number <>0,
if the partial result string characterizes a single limit excess.

<Freq1>: Start frequency of the measurement range or frequency where the limit line is exceeded

<Freq2>: Start frequency of the measurement range or frequency exceeding the measurement range. The value of <Freq2> is equal to the value of <Freq1>, if either the measurement is performed in the time domain or if the partial result string contains a limit excess.

<Level>: Measured maximum level of the partial range or measured level at the test point.

<Limit>: Limit in the partial range or at the test point

<Abs/Rel>: ABS <Level> and <Limit> are in absolute units (dBm)
REL <Level> and <Limit> are in absolute units (dBm)

<Status>: Result of the limit check in character data form:
PASSED no limit exceeded
FAILED limit exceeded
MARGIN margin exceeded
EXC limit excess marked as an exception

The frequencies <Freq1> and <Freq2> are always absolute i. e. not referred to the carrier frequency.

Example: "FETC:SPEC:MOD? TXB"
Result: 0,890E6,915E6,-87.4,-108.0,ABS,FAILED,
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the modulation spectrum is selected (see CONFigure:SPECtrum:MODulation).

FETCh:SPECtrum:SWITching[:ALL]?

This command reads out the result of the measurement of the transient spectrum of the base station or mobile.

Syntax: FETCh:SPECtrum:SWITching[:ALL]?

The result is output as a list of partial result strings separated by ',' as for the command FETCh:SPECtrum:MODulation[:ALL?].

Example: "FETC:SPEC:SWIT?"
Result: 0,833.4E6,833.4E6,37.4,-36.0,ABS,MARGIN,
1,834.0E6,834.0E6,-35.2,-36.0,ABS,FAILED,
2,834.6E6,834.6E6,-74.3,-75.0,REL,FAILED
0,835.0E6,835.0E6,-65,0,-60.0,REL,PASSED

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the transient spectrum is selected (see CONFigure:SPECtrum:MODulation).

3.6.9.3 FETCh:SPURious Subsystem

This subsystem provides the commands for reading out results of measurements in the GSM BTS (FSE-K11) or GSM MS (FSE-K10) Analyzer mode which are used to determine spurious emissions, without first restarting a new measurement.

COMMAND	PARAMETERS	UNIT	COMMENT
FETCh			Option FSE-K11 or FSE-K10
:SPURIOUS			
[:ALL?]	TXBand | OTXBand | RXBand | IDLeband		
:STEP?	--		

FETCh:SPURious[:ALL]?

This command reads out the results of the measurement of spurious emissions of the base station or mobile which is performed in the LIST mode.

Syntax: FETCh:SPURious[:ALL]? TXBand | OTXBand | RXBand | IDLeband

TXBand::= TX-band
OTXBand::= Not TX-band
RXBand::= RX-band (option FSE-K11 only)
IDLeband::= Idle band (option FSE-K10 only)

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status> [,
<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status>]...

where the parts between '[...]' denote a partial result string that can be repeated n times.

<Index>: 0, if the partial result string characterizes a measurement range
current number <>0,
if the partial result string characterizes a single limit excess.

<Freq1>: Start frequency of the measurement range or frequency where the limit line is exceeded

<Freq2>: Start frequency of the measurement range or frequency exceeding the measurement range. The value of <Freq2> is equal to the value of <Freq1>, if either the measurement is performed in the time domain or if the partial result string contains a limit excess.

<Level>: Measured maximum level of the partial range or measured level at the test point.

<Limit>: Limit in the partial range or at the test point

<Abs/Rel>: ABS <Level> and <Limit> are in absolute units (dBm)
REL <Level> and <Limit> are in absolute units (dBm)

<Status>: Result of the limit check in character data form:
PASSED no limit exceeded
FAILED limit exceeded
MARGIN margin exceeded

Example: "FETC:SPUR? TXB"
Result: 0,890E6,915E6,-87.4,-108.0,ABS,FAILED,
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.

This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the spurious emissions is selected (see CONFigure:SPURious).

FETCh:SPURious:STEP?

This command reads out the result of the last single step of the measurement of spurious emissions performed in the STEP mode.

Syntax: FETCh:SPURious:STEP?

The result is output as a list of partial result strings separated by ',' as for the command FETCh:SPURious[:ALL?].

Example: "FETC:SPUR:STEP?"
Result: 0,890E6,915E6,-87.4,-108.0,ABS,FAILED,
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED

Features: *RST value: --
SCPI: device-specific

If no measurement has been performed yet, a query error results.

This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the spurious emissions is selected (see CONFigure:SPURious).

3.6.10 FORMat Subsystem

The FORMat subsystem specifies the data format of the data transmitted from and to the analyzer.

COMMAND	PARAMETERS	UNIT	COMMENT
FORMat [:DATA]	ASCiiIREALIUINT[,<numeric_value>]	-	

FORMat[:DATA]

This command specifies the data format of the data transmitted from and to the analyzer.

Syntax: FORMat[:DATA] ASCii | REALI UINT[,<numeric_value>]
<numeric_value> ::= 32

Example:
```
"FORM REAL,32"
"FORM ASC"
```

Features: *RST value: ASCii
SCPI: conforming

The data format is either ASCii or one of the formats REAL or UINT (Unsigned Integer). ASCii data are transmitted in plain text, separated by commas. REAL data are transmitted as 32-bit IEEE 754 floating-point numbers in the "definite length block". The format UINT is only used in operating mode Vector Signal Analysis, for the symbol table.

The FORMat command is valid for the transmission of trace data. The data format of trace data received by the analyzer is automatically recognized, regardless of the format which is programmed.

3.6.11 HCOPy Subsystem

The HCOPy subsystem controls the output of display information for documentation purposes on output devices or files.

COMMAND	PARAMETERS	UNIT	COMMENT
HCOPy			
:ABORt	--		no query
:DESTination<1|2>	'SYST:COMM:GPIB'| 'SYST:COMM:SER1'| 'SYST:COMM:SER2'| 'SYST:COMM:CENT'| 'MMEM'		no query
:DEVice			
:COLor	<Boolean>		
:LANGuage<1|2>	HPGL | PCL4 | PCL5 | POSTscript | ESCP | WMF| PCX | HP7470 | EPSON24 | EPSON24C | PCL4_C | PCL4_C3 | LASERJ | DESKJ | DESKJ_C | DESKJ_C3 | HPGL_LS | HP7470LS		
:PRESet<1|2>	<Boolean>		
:RESolution<1|2>	<numeric_value>		
[:IMMediate<1|2>]	--		
:ITEM			no query
:ALL			
:FFEed<1|2>			no query
:STATe	<Boolean>		
:LABEL			
:TEXT	<string>		
:PFEed<1|2>			
:STATe	<Boolean>		
:WINDow<1|2>			
:TABle			
:STATe	<Boolean>		
:TEXT	<string>		
:TRACe			
:STATe	<Boolean>		
:CAINcrement	<Boolean>		
:PAGE			
:DIMensions			
:QUADrant<1 to 4>			no query
:FULL			no query
:ORIentation<1|2>	LANDscape|PORTrait		

HCOPy:ABORt

This command aborts a running hardcopy output.

Syntax: HCOPy:ABORt

Example: `"HCOP:ABOR"`

Features: *RST value: -
SCPI: conforming

This command is an event which is why it is not assigned an *RST value and no query.

HCOPy:DESTination<1|2>

This command selects the interface and the configuration (1 or 2) for the hardcopy device.

Syntax: HCOPy:DESTination<1|2> '<string>
<string>::= 'SYST:COMM:GPIB' |
'SYST:COMM:SER1' |
'SYST:COMM:SER2' |
'SYST:COMM:CENT' |
'MMEM'

Example: `"HCOP:DEST2 'SYST:COMM:SER2'"`

Features: *RST value: -
SCPI: conforming

This command is an event which is why it is not assigned an *RST value and no query. `HCOPy:DESTination 'MMEM'` creates a file for the hardcopy output. Command `MMEM:NAME <file_name>` defines the file name.

HCOPy:DEVice:LANGuage<1|2>

This command determines the data format of the printout.

Syntax: HCOPy:DEVice:LANGuage HPGL | PCL4 | PCL5 | POSTscript | ESCP | WMF| PCX | HP7470 | EPSON24| EPSON24C | PCL4_C | PCL4_C3 | LASERJ | DESKJ | DESKJ_C | DESKJ_C3 | HPGL_LS | HP7470LS

Example: `"HCOP:DEV:LANG WMF"`

Features: *RST value: -
SCPI: conforming

HPGL	data format for printout on a plotter in HPGL,
HP7470	special format for printout on a plotter hp7470 (reduced HPGL format)
HPGL_LS and HP7470LS	special HPGL/HP7470-format allowing output of the traces with variable Line_styles
PCL4.and PCL5	generic data formats for laser and ink-jet printers, with PCL4: Black/white PCL4_C: Color (3 color cartridges + black cartridge) PCL4_C3: Color (3 color cartridges only) PCL5: Black/white with 300DPI resolution, new language version.
LASERJ	Data format for HP-laserjet starting with series III
DESKJ...	Data formats for printers of HP-deskjet series, with DESKJ: Black/white DESKJ_C: Color (3 color cartridges + black cartridge, e. g. Deskjet 560) DESKJ_C3: Color (3 color cartridges only, e. g. Deskjet 500)
POSTscript	a printer language,
ESCP	data format for a 24-pin printer.
EPSON24	data format for Epson-compatible 24-needle printers, black/white, e. g. Epson LQ-series, R&S PDN
EPSON24C	data format for Epson-compatible 24-needle color printers, e. g. Epson Stylus Color, R&S PDN Color
WMF (WINDOWS Metafile Format) and PCX (pixel graphics)	data formats for output files which can at a later time be directly integrated in corresponding programs for documentation purposes.

HCOPy:DEVice:COLor

This command selects between color and monochrome hardcopy of the screen.

Syntax: HCOPy:DEVice:COLor ON|OFF

Example: "HCOP:DEV:COL ON"

Features: *RST value: OFF
SCPI: conforming

HCOPy:DEVice:PRESet<1|2>

This command resets the hardcopy unit (1 or 2) prior to generating the hardcopy.

Syntax: HCOPy:DEVice:PRESet<1|2> ON|OFF

Example: `"HCOP:DEV:PRES2 ON"`

Features: *RST value: OFF
SCPI: device-specific

HCOPy:DEVice:RESolution<1|2>

This command controls the resolution of the printout in PCL4 and HP-deskjet format (hardcopy unit 1 or 2).

Syntax: HCOPy:DEVice:RESolution<1|2> 150 | 300

Example: `"HCOP:DEV:RES 300"`

Features: *RST value: 150
SCPI: conforming

The resolution for an output in PCL4 format is between 150 dpi or 300 dpi.

HCOPy[:IMMediate<1|2>]

This command starts a hardcopy output.

Syntax: HCOPy[:IMMediate<1|2>]

Example: `"HCOP"`

Features: *RST value: -
SCPI: conforming

`HCOP[1]` starts the hardcopy output to device 1 (default), `HCOP2` starts the output to device 2. This command is an event which is why it is not assigned an *RST value and has no query.

HCOPy:DEVice:ITEM:ALL

This command selects the complete screen to be output.

Syntax: HCOPy:DEVice:ITEM:ALL

Example: `"HCOP:DEV:ITEM:ALL"`

Features: *RST value: OFF
SCPI: conforming

The hardcopy output is always provided with comments, title, time and date. As an alternative to the whole screen, only traces (commands `'HCOPy:DEVice:WINDow:TRACe: STATe ON'`) or tables (command `'HCOPy:DEVice:WINDow:TABLe:STATe ON'`) can be output.

HCOPy:DEVice:ITEM:FFEed<1|2>:STATe

The command adds a form feed command to the hardcopy output of the screen.

Syntax: HCOPy:DEVice:ITEM:FFEed<1|2>:STATe ON|OFF

Example: `"HCOP:DEV:ITEM:FFE2:STAT ON"`

Features: *RST value: OFF
SCPI: conforming

HCOPy:DEVice:ITEM:LABel:TEXT

This command defines the title of the screen.

Syntax: HCOPy:DEVice:ITEM:LABel:TEXT <string>

Example: `"HCOP:DEV:ITEM:LAB:TEXT 'My Title'"`

Features: *RST value: OFF
SCPI: conforming

HCOPy:DEVice:ITEM:PFEed<1|2>:STATe

This command adds a paper feed command to the hardcopy output of the screen (ON).

Syntax: HCOPy:DEVice:ITEM:PFEed<1|2>:STATe ON|OFF

Example: `"HCOP:DEV:ITEM:PFE2:STAT ON"`

Features: *RST value: OFF
SCPI: device-specific

HCOPy:DEVice:ITEM:WINDow<1|2>:TABle:STATe

This command selects the output of the currently displayed tables (ON).

Syntax: HCOPy:DEVice:ITEM:WINDow<1|2>:TABle:STATe ON | OFF

Example: `"HCOP:DEV:ITEM:WIND:TABL:STAT ON"`

Features: *RST value: OFF
SCPI: device-specific

The command `HCOPy:DEVice:ITEM:WINDow<1|2>:TABle:STATe OFF` same as command `HCOPy:DEVice:ITEM:ALL` enables the output of the whole screen.

HCOPy:DEVice:ITEM:WINDow<1|2>:TEXT

This command defines the comment text for printout to trace 1 or 2.

Syntax: HCOPy:DEVice:ITEM:WINDow<1|2>:TEXT <string>

Example: `"HCOP:DEV:ITEM:WIND2:TEXT 'comment'"`

Features: *RST value: -
SCPI: device-specific

HCOPy:DEVice:ITEM:WINDow<1|2>:TRACe:STATe

This command selects the output of the currently displayed trace (ON).

Syntax: HCOPy:DEVice:ITEM:WINDow<1|2>:TRACe:STATe ON | OFF

Example: `"HCOP:DEV:ITEM:WIND:TRACe:STAT ON"`

Features: *RST value: OFF
SCPI: device-specific

The command `HCOPy:DEVice:ITEM:WINDow<1|2>:TRACe:STATe OFF` same as command `HCOPy:DEVice:ITEM:ALL` enables the output of the whole screen.

HCOPy:DEVice:ITEM:WINDow<1|2>:TRACe:CAINcrement

The command automatically changes the colour of the currently displayed trace after printout (ON).

Syntax: HCOPy:DEVice:ITEM:WINDow<1|2>:TRACe:CAINcrement ON | OFF

Example: `"HCOP:DEV:ITEM:WIND:TRACe:CAIN ON"`

Features: *RST value: OFF
SCPI: device-specific

The automatic change of colour of the trace allows outputting to a plotter of several traces of the same diagram. For a better distinction, the colour of the trace is changed ("Color Auto Increment").

HCOPy:PAGE:DIMensions:QUADrant

The command defines the quadrant which is allocated to the screen output.

Syntax: HCOPy:PAGE:DIMensions:QUADrant<1 to 4>

Example: `"HCOP:PAGE:DIM:QUAD1"`

Features: *RST value: -
SCPI: conforming

The quadrants are defined as QUAD1 at the top right, QUAD2 at the top left, QUAD3 at the bottom left and QUAD4 at the bottom right. This command is an event which is why it is not assigned an *RST value and has no query.

HCOPy:PAGE:DIMensions:FULL

This command defines that the full screen is to be printed out.

Syntax: HCOPy:PAGE:DIMensions:FULL

Example: `"HCOP:PAGE:DIM:FULL"`

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned and *RST value and has no query.

HCOPy:PAGE:ORIentation<1|2>

The command selects the format of the output (portrait and landscape) (hardcopy unit 1 or 2).

Syntax: HCOPy:PAGE:ORIentation<1|2> LANDscape | PORTrait

Example: `"HCOP:PAGE:ORI LAND"`

Features: *RST value: -
SCPI: conforming

3.6.12 INITiate Subsystem

The INITiate subsystem checks the initialization of the trigger subsystem. In the split-screen representation, a distinction is made between INITiate1 (screen A) and INITiate2 (screen B)

COMMAND	PARAMETERS	UNIT	COMMENT
INITiate<1|2>			
:CONTinuous	<boolean>	--	
[:IMMediate]	--	--	no query
:DISPlay	<boolean>	--	

INITiate<1|2>:CONTinuous

This command determines if the trigger system is continuously initiated ("Free Run").

Syntax: INITiate<1|2>:CONTinuous ON | OFF

Example: `"INIT:CONT OFF"`

Features: *RST value: ON
SCPI: conforming

Setting `"INITiate:CONTinuous ON"` corresponds to function SWEEP CONTinuous, ie the sweep of the analyzer is cyclically repeated. The setting `"INITiate:CONTinuous OFF"` corresponds to function SWEEP SINGLE.

INITiate<1|2>[:IMMediate]

The command initiates a new sweep or starts a single sweep.

Syntax: INITiate<1|2>[:IMMediate]

Example: `"INIT"`

Features: *RST value: -
SCPI: conforming

This command is an event which is why it is not assigned an *RST value and has no query.

INITiate<1|2>:DISPlay

This command switches the display on or off during a single sweep.

Syntax: INITiate<1|2>:DISPlay ON | OFF

Example: `"INIT:DISP OFF"`

Features: *RST value: ON
SCPI: device-specific

3.6.13 INPut Subsystem

The INPut subsystem checks the input features of the instrument. In the split-screen representation, a distinction is made between INPut1 (screen A) and INPut2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
INPut<1|2>			
:ATTenuation	<numeric_value>	DB	
:AUTO	<Boolean>	--	
:MODE	NORMal | LNOise|LDIStortion	--	
:UPORt<1|2>			
[:VALue?]	--	--	query only
:STATe	<Boolean>	--	
:IMPedance	50 | 75	OHM	
:CORRection	RAM | RAZ		
:MIXer	<numeric_value>	DBM	

INPut<1|2>:ATTenuation

This command programs the input attenuator.

Syntax: INPut<1|2>:ATTenuation <numeric_value>
<numeric_value>::= 0 to 70 dB

Example: `"INP:ATT 40dB"`

Features: *RST value: - (AUTO is set to ON)
SCPI: conforming

The input attenuator can be programmed in steps of 10 dB. If the attenuation is directly programmed, the coupling to the reference level is switched off.

INPut<1|2>:ATTenuation:AUTO

This command automatically couples the input attenuation to the reference level.

Syntax: INPut<1|2>:ATTenuation:AUTO ON | OFF

Example: `"INP:ATT:AUTO ON"`

Features: *RST value: ON
SCPI: conforming

INPut<1|2>:ATTenuation:AUTO:MODE

This command optimizes the coupling of the input attenuation to the reference level to high sensitivity or to high intermodulation immunity.

Syntax: INPut<1|2>:ATTenuation:AUTO:MODE NORMal | LNOise | LDIStortion

Example: `"INP:ATT:AUTO:MODE LDIS"`

Features: *RST value: ON
SCPI: device-specific

For `LNOise`, the input attenuator value is set 10 dB lower than for `INPut:ATTenuation:AUTO:MODE NORMal`, for `LDIStortion` it is set 10 dB higher.

INPut<1|2>:UPORt<1|2>[:VALue]?

This command queries the control lines of the user ports.

Syntax: INPut<1|2>:UPORt<1|2>[:VALue]?

Example: `"INP:UPOR2?"`

Features: *RST value: -
SCPI: device-specific

This command is a query command which is why it is not assigned an *RST value.

INPut<1|2>:UPORt<1|2>:STATe

This command toggles the control lines of the user ports between INPut and OUTPut.

Syntax: INPut<1|2>:UPORt<1|2>:STATe ON | OFF

Example: `"INP:UPOR2:STAT ON"`

Features: *RST value: ON
SCPI: device-specific

With ON, the user port is switched to INPut, with OFF to OUTPut.

INPut<1|2>:IMPedance

This command sets the nominal input impedance of the analyzer.

Syntax: INPut<1|2>:IMPedance 50 | 75

Example: `"INP:IMP 75"`

Features: *RST value: 50
SCPI: conforming

Switching the input impedance to 75 Ω includes the matching elements RAM or RAZ selected by the command `INPut:IMPedance:CORRection`.

INPut<1|2>:IMPedance:CORRection

This command selects the matching element for 75 Ω input impedance.

Syntax: INPut<1|2>:IMPedance:CORRection RAM | RAZ

Example: `"INP:IMP:CORR RAM"`

Features: *RST value: - (INPut:IMPedance = 50 Ω)
SCPI: device-specific

INPut<1|2>:MIXer

This command defines the nominal mixer level of the analyzer.

Syntax: INPut<1|2>:MIXer <numeric value>
<numeric_value>::= -10 to -100 dBm

Example: `"INP:MIX -30"`

Features: *RST value: -
SCPI: device-specific

3.6.14 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

COMMAND	PARAMETERS	UNIT	COMMENT
INSTrument<1|2>			
[:SELect]	SANalyzer | DDEMod | ADEMod | BSGM | MGSM		Vector Signal Analysis FSE-K11 or FSE-K10
:NSELect	<numeric_value>		
:COUPle	NONE | MODE | X | Y | CONTrol | XY | XCONtrol | YCONtrol | ALL		

INSTrument[:SELect]

This command switches between the operating modes by means of text parameters.

Syntax: INSTrument[:SELect] SANalyzer | DDEMod | ADEMod | BGSM
SANalyzer: spectrum analysis
DDEMod: vector signal analysis, digital demodulation
ADEMod: vector signal analysis, analog demodulation
BGSM: GSM BTS analysis
MGSM: GSM MS analysis

Example: `"INST DDEM"`

Features: *RST value: SANalyzer
SCPI: conforming

Switchover to DDEMod or ADEMod is only possible in conjunction with option FSE-B7, Vector Signal Analysis.
Switchover to BGSM is only possible in conjunction with option FSE-K11, GSM BTS Analyzer
Switchover to MGSM is only possible in conjunction with option FSE-K10, GSM MS Analyzer

INSTrument:NSELect

This command switches between the two modes by means of numbers.

Syntax: INSTrument:NSELect 1 | 2 | 3 | 4
1: spectrum analysis
2: vector signal analysis, digital demodulation
3: vector signal analysis, analog demodulation
4: GSM BTS analysis
5: GSM MS analysis

Example: `"INST:NSEL 2"`

Features: *RST value: 1
SCPI: conforming

Switchover to 2 or 3 is only possible in conjunction with option FSE-B7, Vector Signal Analysis.
Switchover to 4 is only possible in conjunction with option FSE-K11, GSM BTS Analyzer
Switchover to 5 is only possible in conjunction with option FSE-K10, GSM MS Analyzer

INSTrument:COUPle

This command defines the coupling between the two measurement windows screen A and B.

Syntax:	INSTrument:COUPle	NONE | MODE | X | Y | CONTrol | XY | XCONtrol | YCONtrol | ALL
Example:	`"INST:COUP NONE"`	
Features:	*RST value: ALL SCPI: device specific	
NONE	no coupling.	
MODE	the operating mode of the two screens is coupled.	
X or Y	the scaling of the x- or y axis of the two screens is coupled.	
CONTrol	the trigger and gate parameter ,and the sweep parameters SINGle/ CONTinous and COUNt of the two screens are coupled.	
XY	the scaling of the x- and y-axis of the two screens are coupled.	
XCONTrol bzw. YCONTrol	the trigger and gate parameter, and the sweep parameters SINGle CONTinous/ COUNt of the two screens are coupled.	
ALL	the scaling of the x- or y axis the trigger and gate parameter and the sweep parameters SINGle/ CONTinous/ COUNt of the two screens are coupled.	

3.6.15 MMEMory Subsystem

The MMEMory (mass memory) subsystem provides commands which allow for access to the storage media of the instrument and for storing and loading various instrument settings.
The NAME command stores the HCOPy outputs in a file.
The various drives can be addressed via the mass storage unit specifier <msus> using the conventional DOS syntax. The internal hard disk is addressed by "C:", the floppy-disk drive installed by "A:".
The file names <file_name> are indicated as string parameters with the commands being enclosed in quotation marks. They correspond to the DOS conventions.
DOS file names consist of max. 8 ASCII characters and an extension of up to three characters separated from the file name by a colon "." Both, the colon and the extension are optional. The colon is not part of the file name. DOS file names do not differ between uppercase and lowercase notation. All letters and digits are permitted as well as the special characters "_", "^", "$", "~", "!", "#", "%", "&", "-", "{", "}", "(", ")", "@" and "`". Reserved file names are CLOCK$, CON, AUX, COM1 to COM4, LPT1 to LPT3, NUL and PRN.
The two characters "*" and "?" have the function of so-called "wildcards", i.e., they are variables for selection of several files. The question mark "?" replaces exactly one character which may be any, the asterisk means any of the remaining characters in the file name. "*.*" thus means all files in a directory.

COMMAND	PARAMETERS	UNIT	COMMENT
MMEMory			
:CDIRectory	<directory_name>	--	
:COPY	<file_name>,<file_name>	--	no query
:DELete	<file_name>	--	no query
:INITialize	<msus>	--	no query
:LOAD			
:STATe	1,<file_name>	--	no query
:AUTO	1,<file_name>	--	no query
:MDIRectory	<directory_name>	--	no query
:MOVE	<file_name>,<file_name>	--	no query
:MSIS	<msus>	--	
:NAME	<file_name>	--	
:RDIRectory	<directory_name>	--	no query
:STORe			
:STATe	1,<file_name>	--	no query
:CLEar			
:STATe	1,<file_name>	--	no query
:ALL			no query
:SELect			
[:ITEM]			
:GSETup	<Boolean>		
:HWSettings	<Boolean>		
:TRACE<1 to 4>	<Boolean>		
:LINes			
[:ACTive]	<Boolean>		
:ALL	<Boolean>		
:CSETup	<Boolean>		
:HCOPy	<Boolean>		
:MACRos	<Boolean>		
:SCData	<Boolean>		Option FSE-B8 to B11
:TRANsducer			
[:ACTive]	<Boolean>		
:ALL	<Boolean>		
:ALL	--		no query
:NONE	--		no query
:DEFault	--		no query
:COMMent	<string>		

MMEMory:CDIRectory

This command changes the current directory.

Syntax: MMEMory:CDIRectory <directory_name>
<directory_name>::= DOS path name

Example: "MMEM:CDIR 'C:\USER\DATA'"

Features: *RST value: -
SCPI: conforming

In addition to the path name, the indication of the directory may contain the drive name. The path name complies with the DOS conventions.

MMEMory:COPY

This command copies the files indicated.

Syntax: MMEMory:COPY <file_source>,<file_destination>
<file_source>,<file_destination> ::= <file_name>
<file_name> ::= DOS file name

Example: "MMEM:COPY 'C:\USER\DATA\SETUP.CFG','A:'"

Features: *RST value: -
SCPI conforming

The indication of the file name may include the path and the drive. The file names and path information must be in accordance with the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:DELete

This command deletes the files indicated.

Syntax: MMEMory:DELete <file_name>
<file_name> ::= DOS file name

Example: "MMEM:DEL 'TEST01.HCP'"

Features: *RST value: -
SCPI: conforming

The indication of the file name contains the path and, optionally, the drive. Indication of the path corresponds to the DOS conventions. The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:INITialize

This command formats the disk in drive A.

Syntax: MMEMory:INITialize <msus>
<msus> ::= 'A:'

Example: "MMEM:INIT 'A:'"

Features: *RST value: -
SCPI: conforming

Formatting deletes all data stored on the floppy disk. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:LOAD:STATe

This command loads instrument settings from files.

Syntax: MMEMory:LOAD:STATe 1,<file_name>
<file_name> ::= DOS file name without extension

Example: "MMEM:LOAD:STAT 1,'A:TEST'"

Features: *RST value: -
SCPI: conforming

The contents of the file is loaded and set as new instrument state. The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:LOAD:AUTO

This command defines which device setting is automatically loaded after the instrument is switched on.

Syntax: MMEMory:LOAD:AUTO 1,<file_name>
<file_name> ::= DOS file name without extension;
FACTORY denotes the data set previously in the instrument

Example: "MMEM:LOAD:AUTO 1,'C:\USER\DATA\TEST'"

Features: *RST value: -
SCPI: device-specific

The contents of the file are read after switching on the instrument and used to define the new device state. The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:MDIRectory

This command creates a new directory.

Syntax: MMEMory:MDIRectory <directory_name>
<directory_name>::= DOS path name

Example: "MMEM:MDIR 'C:\USER\DATA'"

Features: *RST value: -
SCPI: device-specific

The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:MOVE

This command renames existing files.

Syntax: MMEMory:MOVE <file_source>,<file_destination>
<file_source>,<file_destination> ::= <file_name>
<file_name> ::= DOS file name

Example: "MMEM:MOVE 'TEST01.CFG','SETUP.CFG'"

Features: *RST value: -
SCPI: conforming

The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:MSIS

This command changes to the drive indicated.

Syntax: MMEMory:MSIS <device>
<device>::= 'A:' | 'C:'

Example: "MMEM:MSIS 'A:'"

Features: *RST value: "C:'
SCPI: conforming

The drive may be the internal hard disk C: or the floppy-disk drive A:. The drive is indicated according to the DOS conventions.

MMEMory:NAME

This command specifies a file which is printed or plotted to.

Syntax: MMEMory:NAME <file_name>
<file_name> ::= DOS filename

Example: "MMEM:NAME 'PLOT1.HPG'"

Features: *RST value: -
SCPI: conforming

The file name includes indication of the path and may also include the drive. The file name and path information correspond to the DOS conventions. The output to the printer is routed into a file using the command "HCOP:DEST 'MMEM'".

MMEMory:RDIRectory

This command deletes the directory indicated.

Syntax: MMEMory:RDIRectory <directory_name>
<directory_name>::= DOS path name

Example: "MMEM:RDIR 'C:\TEST'"

Features: *RST value: -
SCPI: device-specific

The directory name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:STORe:STATe

This command stores the current instrument setting in a file.

Syntax: MMEMory:STORe:STATe 1,<file_name>
<file_name> ::= DOS file name without extension

Example: "MMEM:STOR:STAT 1,'TEST'"

Features: *RST value: -
SCPI: conforming

The current instrument state is stored as a file. The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:CLEar:STATe

This command deletes the instrument setting denoted by <file_name>.

Syntax: MMEMory:CLEar:STATe 1,<file_name>
<file_name> ::= DOS file name without extension

Example: "MMEM:CLE:STAT 1,'TEST'"

Features: *RST value: -
SCPI: device-specific

The device data set specified is deleted. The file name includes indication of the path and may also include the drive. The path name corresponds to the DOS conventions. This command is an event which is why it is not assigned an *RST value and has no query.

MMEMory:CLEar:ALL

This command deletes all instrument settings in the current directory.

Syntax: MMEMory:CLEar:ALL

Example: "MMEM:CLE:ALL"

Features: *RST value: -
SCPI: device-specific

This command is an "event" which is why it is not assigned an *RST value and has no query.

MMEMory:SELect[:ITEM]:GSETup

This command includes the data of the general setup in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:GSETup ON | OFF

Example: "MMEM:SEL:GSET ON"

Features: *RST value: OFF
SCPI: device-specific

MMEMory:SELect[:ITEM]:HWSettings

This command includes the hardware settings in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:HWSettings ON | OFF

Example: "MMEM:SEL:HWS ON"

Features: *RST value: ON
SCPI: device-specific

Level and frequency lines are stored with this command as well.

MMEMory:SELect[:ITEM]:TRACe<1 to 4>

This command includes the data of the selected trace in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:TRACe<1 to 4> ON | OFF

Example: "MMEM:SEL:TRACE3 ON"

Features: *RST value: OFF for all Traces
SCPI: device-specific

MMEMory:SELect[:ITEM]:LINes[:ACTive]

This command includes the active limit lines in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:LINes[:ACTive] ON | OFF

Example: "MMEM:SEL:LIN ON"

Features: *RST value: ON
SCPI: device-specific

Upon MMEM:LOAD the limit lines which are not currently active but contained in the data set are restored as well.

MMEMory:SELect[:ITEM]:LINes:ALL

This command includes all limit lines in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:LINes:ALL ON | OFF

Example: "MMEM:SEL:LIN:ALL ON"

Features: *RST value: ON
SCPI: device-specific

This command includes selection of the active limit lines.

MMEMory:SELect[:ITEM]:CSETup

This command includes the current color setting in the list of partial datasets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:CSETup ON | OFF

Example: "MMEM:SEL:CSET ON"

Features: *RST value: ON
SCPI: device-specific

MMEMory:SELect[:ITEM]:HCOPy

This command includes the hardcopy settings in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:HCOPy ON | OFF

Example: "MMEM:SEL:HCOPy ON"

Features: *RST value: ON
SCPI: device-specific

MMEMory:SELect[:ITEM]:MACRos

This command includes the keyboard macros in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:MACRos ON | OFF

Example: "MMEM:SEL:MACRos ON"

Features: *RST value: OFF
SCPI: device-specific

MMEMory:SELect[:ITEM]:SCData

This command includes the generator calibration data in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:SCData ON | OFF

Example: "MMEM:SEL:SCData ON"

Features: *RST value: OFF
SCPI: device-specific

This command only available in conjunction with the option Tracking Generator FSE-B8 to -B11

MMEMory:SELect[:ITEM]:TRANsducer[:ACTive]

This command includes the active transducer factors and set in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:TRANsducer[:ACTive] ON | OFF

Example: "MMEM:SEL:TRAN ON"

Features: *RST value: ON
SCPI: device-specific

Upon MMEM:LOAD the transducer factors and sets which are not currently active but contained in the data set are restored as well.

MMEMory:SELect[:ITEM]:TRANsducer:ALL

This command includes all transducer factors and sets in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:TRANsducer:ALL ON | OFF

Example: "MMEM:SEL:TRAN:ALL ON"

Features: *RST value: ON
SCPI: device-specific

This command is an event and therefore has no *RST value assigned.

MMEMory:SELect[:ITEM]:ALL

This command includes all partial data sets in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:ALL

Example: "MMEM:SEL:ALL"

Features: *RST value: --
SCPI: device-specific

This command is an event and therefore has no *RST value assigned.

MMEMory:SELect[:ITEM]:NONE

This command deletes all partial data sets in the list of partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:NONE

Example: "MMEM:SEL:NONE"

Features: *RST value: --
SCPI: device-specific

This command is an event and therefore has no *RST value assigned.

MMEMory:SELect[:ITEM]:DEFault

This command sets the default list of the partial data sets of a device setting to be stored/loaded.

Syntax: MMEMory:SELect[:ITEM]:DEFault

Example: "MMEM:SEL:DEFault"

Features: *RST value: --
SCPI: device-specific

This command is an event and therefore has no *RST value assigned.

MMEMory:COMMent

This command defines a comment for a device setting to be stored.

Syntax: MMEMory:COMMent <string>

Example: "MMEM:COMM 'Setup for GSM measurement'"

Features: *RST value: blank comment
SCPI: device-specific

3.6.16 OUTPut Subsystem

The OUTPut subsystem checks the output features of the instrument.
In conjunction with option FSE-B8/B11, tracking generator, in the split screen mode, a distinction is made between OUTPut1 (screen A) and OUTPut2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
OUTPut<1|2>			
[:STATe]	<boolean>	--	Option FSE-B8 to B11
:UPORt<1|2>			
[:VALue]	<binary>	--	
:STATe	<boolean>	--	
:AF			
:SENSitivity	<numeric_value	PCT | HZ | KHZ | DEG | RAD	Vector Signal Analysis

OUTPut<1|2>[:STATe]

This command switches the tracking generator on or off.

Syntax: OUTPut:[:STATe] ON | OFF

Example: `"OUTP ON"`

Features: *RST value: -
SCPI: conforming

This command is only valid in conjunction with one of the options FSE-B8 to FSE-B11.

OUTPut:UPORt<1|2>[:VALue

This command sets the control lines of the user ports.

Syntax: OUTPut:UPORt<1|2>[:VALue] <binary>
<Binary>::= #B00000000 to #B11111111

Example: `"OUTP:UPOR2 #B10100101"`

Features: *RST value: -
SCPI: device-specific

User port 1 or 2 is written with the given binary pattern. If the user port is programmed to INPut instead of OUTPut, the output value is temporarily stored.

OUTPut:UPORt<1|2>:STATe

This command toggles the control lines of the user ports between INPut and OUTPut.

Syntax: OUTPut:UPORt<1|2>:STATe ON | OFF

Example: `"OUTP:UPOR:STAT ON"`

Features: *RST value: OFF
SCPI: device-specific

With ON, the user port is switched to OUTPut, with OFF to INPut.

OUTPut:AF:SENSitivity

This command changes the sensitivity of the AF-output.

Syntax: OUTPut:AF:SENSitivity <numeric_value>
<numeric_value> ::= 0.1 PCT to 100 PCT for AM
0.1 KHZ to 100 KHZ for FM
0.0 1RAD to 10 RAD for PM

Example: `"OUTP:AF:SENS 20PCT"`

Features: *RST value: 100 % for AM
100 kHz for FM
10 rad for PM
SCPI: device-specific

The command is only valid in the analog demodulation mode (Vector Signal Analysis, FSE-B7).

3.6.17 READ Subsystem

The READ-subsystem contains commands for starting complex measurement tasks such as those provided by options GSM BTS Analyzer (FSE-K11) or GSM MS Analyzer (FSE-K10), and for querying the results subsequently. The READ-subsystem is closely linked to the functions of the CONFigure- and FETCh-subsystems, where the measurement sequences are configured or the results are queried without restarting a new measurement.

3.6.17.1 READ:BURSt Subsystem

This subsystem provides the commands for starting measurements in the GSM BTS Analyzer mode (option FSE-K11), which are performed on individual bursts (carrier power, phase/frequency error), and for reading out the results subsequently.

COMMAND	PARAMETERS	UNIT	COMMENT
READ			
:BURSt			Option FSE-K11 or FSE-K10
:PERRor			
:RMS			
:AVERage?	--		query only
:MAXimum?	--		query only
:PEAK			
:AVERage?	--		query only
:MAXimum?	--		query only
:FERRor			
:AVERage?	--		query only
:MAXimum?	--		query only
:POWer?	--		
:STATic?	--		query only; FSE-K11 only
:DYNamic?	--		query only; FSE-K11 only
:LEVel?	--		query only; FSE-K10 only

READ:BURSt:PERRor:RMS:AVERage?

This command starts the measurement of the phase and frequency error of the base station or mobile and reads out the average of the RMS-measurement of the phase error taken over the selected number of bursts.

Syntax: READ:BURSt:PERRor:RMS:AVERage?

Example: "READ:BURS:PERR:RMS:AVER?"

Features: *RST value: --
SCPI: device-specific

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the phase/frequency error measurement can be then queried without restart of the measurement via the FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

READ:BURSt:PERRor:RMS:MAXimum?

This command starts the measurement of the phase and frequency error of the base station or mobile and reads out the maximum of the RMS-measurement of the phase error for the selected number of bursts.

Syntax: READ:BURSt:PERRor:RMS:MAXimum?

Example: "READ:BURS:PERR:RMS:MAX?"

Features: *RST value: --
SCPI: device-specific

When the measurement is started the instrument automatically assumes the SINGLE mode.
An ongoing measurement can be aborted via the command ABORt. Further results of the phase/frequency error measurement can be then queried without restart of the measurement via the FETCh:BURSt-subsystem.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

READ:BURSt:PERRor:PEAK:AVERage?

This command starts the measurement of the phase and frequency error of the base station or mobile and reads out the maximum of the peak measurement of the phase error taken over the selected number of bursts.

Syntax: READ:BURSt:PERRor:PEAK:AVERage?

Example: "READ:BURS:PERR:PEAK:AVER?"

Features: *RST value: --
SCPI: device-specific

When the measurement is started the instrument automatically assumes the SINGLE mode.
An ongoing measurement can be aborted via the command ABORt. Further results of the phase/frequency error measurement can be then queried without restart of the measurement via the FETCh:BURSt-subsystem.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

READ:BURSt:PERRor:PEAK:MAXimum?

This command starts the measurement of the phase and frequency error of the base station or mobile and reads out the maximum of the peak measurement of the phase error for the selected number of bursts.

Syntax: READ:BURSt:PERRor:PEAK:MAXimum?

Example: "READ:BURS:PERR:PEAK:MAX?"

Features: *RST value: --
SCPI: device-specific

When the measurement is started the instrument automatically assumes the SINGLE mode.
An ongoing measurement can be aborted via the command ABORt. Further results of the phase/frequency error measurement can be then queried without restart of the measurement via the FETCh:BURSt-subsystem.
This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

READ:BURSt:FERRor:AVERage?

This command starts the measurement of the phase and frequency error of the base station or mobile and reads out the average of the frequency error taken over the selected number of bursts.

Syntax: READ:BURSt:FERRor:AVERage?

Example: "READ:BURS:FERR:AVER?"

Features: *RST value: --
SCPI: device-specific

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the phase/frequency error measurement can be then queried without restart of the measurement via the FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

READ:BURSt:FERRor:MAXimum?

This command starts the measurement of the phase and frequency error of the base station or mobile and reads out the maximum of the frequency error for the selected number of bursts.

Syntax: READ:BURSt:FERRor:MAXimum?

Example: "READ:BURS:FERR:MAX?"

Features: *RST value: --
SCPI: device-specific

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the phase/frequency error measurement can be then queried without restart of the measurement via the FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the phase/frequency error is selected (see CONFigure:BURSt:PFERror).

READ:BURSt:POWer?

This command starts the measurement of the maximum output power of the base station or mobile and reads out the result.

Measurement of the maximum output power marks the beginning of a measurement cycle where subsequently the limits of the static and dynamic power control levels are checked step by step (`READ:BURSt:STATic?` or `READ:BURSt:DYNamic?`).

Syntax: READ:BURSt:POWer?

The result is read out as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>,
<Delta>,<Status>

<Static Power Ctrl>:	0
<Dyn Power Ctrl>:	0
<Rat-Level>:	rated value for the current power control level acc. to standard in dBm
<Act-Level>:	measured power in dBm
<Delta>:	0
<Status>:	result of limit check in character data form: PASSED no limits exceeded FAILED limit exceeded

Example: `"READ:BURS:POW?"`
Result: `0,0,43,44.1,0,PASSED`

Features: *RST value: --
SCPI: device-specific

When the measurement is started any ongoing measurement cycle is aborted.
An ongoing measurement can be aborted with the command `ABORT`. This command is a query only and has therefore no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and when measurement of the maximum carrier power is selected (see `CONFigure:BURSt:POWer`).

READ:BURSt:POWer:STATic?

This command increases the static power control level for the measurement by one step, measures the output power of the base station and reads out the result.

If the command `READ:BURSt:POWer:STATic?` is repeated after the maximum static power control level is reached, the measurement sequence is terminated and the result of the maximum static power control level is read out again. In this case the value 'FINISHED' indicating the status is read out. Before the status value 'FINISHED' is read out, the value 'RUNNING' is output if the total result of the limit check is queried via `CALCulate<1|2>:LIMit<1 to 8>:BURSt:POWer?`.

Syntax: READ:BURSt:POWer:STATic?

The result is read out as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>,
<Delta>,<Status>

<Static Power Ctrl>:	current static power control level	
<Dyn Power Ctrl>:	current dynamic power control level	
<Rat-Level>:	rated value for the current power control level acc. to standard in dBm	
<Act-Level>:	measured power in dBm	
<Delta>:	difference between the measured power and the power at the previous static power control level.	
<Status>:	result of the limit check in character data form:	
	PASSED	no limit exceeded
	FAILED	limit exceeded
	FINISHED	measurement sequence terminated

Example: `"READ:BURS:POW:STAT?"`
Result: `1,0,41,42.5,1.6,PASSED`

Features: *RST value: --
SCPI: device-specific

The command `ABORt` terminates an ongoing measurement and resets the static and dynamic power control level to 0.
This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, and if measurement of the maximum carrier power is selected. (see `CONFigure:BURSt:POWer`).

READ:BURSt:POWer:DYNamic?

This command increases the dynamic power control level for the measurement by one step, measures the output power of the base station and reads out the result.

Once the maximum dynamic power control level is reached the command is accepted only after the static power control level is increased by one step.

Note that the command is no longer accepted after the measurement sequence is terminated which implies that the static power control level was read out again with `READ:BURSt:POWer:STATic?` after the maximum value was reached and marked with the 'FINISHED' status.

Syntax: READ:BURSt:POWer:DYNamic?

The result is read out as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>,
<Delta>,<Status>

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	rated value for the current power control level acc. to standard in dBm
<Act-Level>:	measured power in dBm
<Delta>:	difference between the measured power and the power at the previous dynamic power control level.
<Status>:	result of the limit check in character data form: PASSED no limit exceeded FAILED limit exceeded

Example: `"READ:BURS:POW:DYN?"`
Result: `1,3,35,32.5,5.6,FAILED`

Features: *RST value: --
SCPI: device-specific

The command `ABORt` terminates an ongoing measurement and resets the static and dynamic power control level to 0.
This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, and if measurement of the maximum carrier power is selected. (see `CONFigure:BURSt:POWer`).

READ:BURSt:POWer:LEVel?

This command increases the power control level for the measurement by one step, measures the output power of the mobile and reads out the result.

Note that the command is no longer accepted after the measurement sequence is terminated which implies that the power control level was read out again with `READ:BURSt:POWer:LEVel?` after the maximum value was reached and marked with the 'FINISHED' status.

Syntax: READ:BURSt:POWer:LEVel?

The result is read out as an ASCII string in the following format:

<0>, <Power Ctrl Level>,<Rat-Level>,<Act-Level>, <Delta>,<Status>

<0>:	always 0 (this field is only significant for option FSE-K11)
<Power Ctrl Level>:	current power control level
<Rat-Level>:	rated value for the current power control level acc. to standard in dBm
<Act-Level>:	measured power in dBm
<Delta>:	difference between the measured power and the power at the previous power control level.
<Status>:	result of the limit check in character data form: PASSED no limit exceeded FAILED limit exceeded

Example: `"READ:BURS:POW:LEV?"`
Result: `0,3,35,32.5,5.6,FAILED`

Features: *RST value: --
SCPI: device-specific

The command `ABORt` terminates an ongoing measurement and resets the power control level to 0. This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM MS Analyzer, FSE-K10, and if measurement of the maximum carrier power is selected. (see `CONFigure:BURSt:POWer`).

3.6.17.2 READ:SPECtrum Subsystem

This subsystem provides the commands for starting measurements in the GSM BTS (option FSE-K11) and GSM MS (option FSE-K10) Analyzer mode, which are used to measure the power of the spectral components due to modulation and switching (modulation spectrum, transient spectrum), and for reading out the results subsequently.

COMMAND	PARAMETERS	UNIT	COMMENT
READ			
:SPECtrum			Option FSE-K11 or FSE-K10
:MODulation			
[:ALL?]	--		
:SWITching			
[:ALL?]	--		

READ:SPECtrum:MODulation[:ALL]?

This command starts the measurement of the modulation spectrum of the base station or mobile and reads out the result. The measurement is performed in the currently set frequency range.

Syntax: READ:SPECtrum:MODulation[:ALL]?

The result is read out as a list of partial ASCII result strings separated by ',' in the following format:

<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status> [,
<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status>]...

where the part set in '[...]' characterizes a partial result string which can be repeated n times.

<Index>: 0, if the partial result string characterizes a measurement range.
current number <>0, if the partial result string characterizes a single limit excess.

<Freq1>: Start frequency of the measurement range or frequency where the limit is exceeded.

<Freq2>: Stop frequency of the measurement range or frequency where the measured range is exceeded. The value of <Freq2> is equal to the value of <Freq1>, if either the measurement is performed in the time domain or the partial result string contains a limit excess.

<Level>: Measured maximum level of the partial range or measured level at the test point.

<Limit>: Limit in the partial range or at the test point.

<Abs/Rel>: ABS <Level> and <Limit> are in absolute units (dBm)
REL <Level> and <Limit> are in relative units (dBm)

<Status>: Result of the limit check in character data form:
PASSED no limit exceeded
FAILED limit exceeded
MARGIN margin exceeded
EXC limited excess characterized as an exception

The frequencies <Freq1> and <Freq2> are always absolute and not referred to the carrier frequency.

Example: "READ:SPEC:MOD?"
Result: 0,890E6,915E6,-87.4,-108.0,ABS,FAILED,
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED

Features: *RST value: --
SCPI: device-specific

The command ABORt aborts an ongoing measurement.
This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the modulation spectrum is selected. (see CONFigure:SPECtrum:MODulation).

READ:SPECtrum:SWITching[:ALL]?

This command starts the measurement of the transient spectrum of the base station or mobile and reads out the result.

Syntax: READ:SPECtrum:SWITching[:ALL]?

The result is read out as a list of partial ASCII result strings separated by ',' in the format used for READ:SPECtrum:MODulation[:ALL?].

Example: "READ:SPEC:SWIT?"
Result: 0,833.4E6,833.4E6,37.4,-36.0,ABS,MARGIN,
1,834.0E6,834.0E6,-35.2,-36.0,ABS,FAILED,
2,834.6E6,834.6E6,-74.3,-75.0,REL,FAILED
0,835.0E6,835.0E6,-65,0,-60.0,REL,PASSED

Features: *RST value: --
SCPI: device-specific

The command ABORt aborts an ongoing measurement.
This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the transient spectrum is selected. (see CONFigure:SPECtrum:SWITCHing).

3.6.17.3 READ:SPURious Subsystem

This subsystem provides the commands for starting measurements in the GSM BTS (option FSE-K11) and GSM MS (option FSE-K10) Analyzer mode, which are used to measure the power of spurious emissions, and for reading out the results subsequently.

COMMAND	PARAMETERS	UNIT	COMMENT
READ :SPURIOUS [:ALL?] :STEP?			Option FSE-K11 or FSE-K10

READ:SPURious[:ALL]?

This command starts the measurement of the spurious emissions of the base station or mobile and reads out the result. The measurement is performed in the currently set frequency range.

Syntax: READ:SPUR[:ALL]?

The result is read out as a list of partial ASCII result strings separated by ',' in the following format:

<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status> [,
<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status>]...

where the part set in '[...]' characterizes a partial result string which can be repeated n times.

<Index>: 0, if the partial result string characterizes a measurement range.
current number <>0, if the partial result string characterizes a single limit excess.

<Freq1>: Start frequency of the measurement range or frequency where the limit is exceeded.

<Freq2>: Stop frequency of the measurement range or frequency where the measured range is exceeded. The value of <Freq2> is equal to the value of <Freq1>, if either the measurement is performed in the time domain or the partial result string contains a limit excess.

<Level>: Measured maximum level of the partial range or measured level at the test point.

<Limit>: Limit in the partial range or at the test point.

<Abs/Rel>: ABS <Level> and <Limit> are in absolute units (dBm)
REL <Level> and <Limit> are in absolute units (dBm)

<Status>: Result of the limit check in character data form:
PASSED no limit exceeded
FAILED limit exceeded
MARGIN margin exceeded

Example: "READ:SPUR?"
Result:
```
0,890E6,915E6,-87.4,-108.0,ABS,FAILED,
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED
```

Features: *RST value: --
SCPI: device-specific

The command ABORt aborts an ongoing measurement.
This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the spurious emissions is selected. (see CONFigure:SPURious).

READ:SPURious:STEP?

This command starts the next single step for measuring the spurious emissions in the STEP mode and reads out the results. The measurement is performed in the currently set frequency range.

If the command READ:SPURious:STEP? is sent again after the last single step is reached, the measurement sequence is terminated, the result of the last single step is output again and characterized by the value 'FINISHED' indicating its status. Until the status value 'FINISHED' is returned, the value 'RUNNING' is output when the total result of the limit check is queried with the command CALCulate<1|2>:LIMit<1 to 8>:SPURious?.

Afterwards, sending the command again causes a restart of the measurement.

Syntax: READ:SPUR:STEP?

The measured result is read out as a list of partial result strings separated by ',' and in the same format as for the command READ:SPURious[:ALL?].
The additional status value 'FINISHED' marks the end of a measurement sequence.

Example: "READ:SPUR:STEP?"

Result:	First query:	0,890E6,915E6,-87.4,-108.0,ABS,FAILED
		...
	Second-last query:	1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED
	Last query:	1,893.2E6,893.2E6,-83.2,-108.0,ABS,FINISHED

Features: *RST value: --
SCPI: device-specific

The command ABORt aborts an ongoing measurement. If the command READ:SPURious:STEP? is sent again, the instrument restarts with the first single step.

This command is only a query and therefore has no *RST value assigned. It is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and if measurement of the spurious emissions is selected. (see CONFigure:SPURious).

3.6.18 SENSe Subsystem

The SENSe subsystem is itself divided up into several subsystems. The commands of these subsystems directly control device-specific settings, they do not refer to the signal characteristics of the measurement signal.
The SENSe subsystem controls the essential parameters of the analyzer and vector analyzer. In accordance with the SCPI standard, it is for this reason optional, which means that it is not necessary to include the SENSe node in command sequences.

3.6.18.1 SENSe:ADEMod Subsystem

This subsystem controls the parameters for analog demodulation. It is active only in conjunction with option Vector Signal Analysis, FSE-B7.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:ADEMod			option Vector Signal Analysis
:AF			
:COUPling	AC | DC		
:SQUelch			
[:STATe]	<Boolean>		
:LEVel	<numeric_value>	DBM	
:SBANd	NORMal | INVerse		
:RTIMe	<Boolean>		

[SENSe:]ADEMod:AF:COUPling

This command selects coupling of the AF-branch.

Syntax: [SENSe:]ADEMod:AF:COUPling AC | DC

Example: `"ADEM:AF:COUP DC"`

Features: *RST value: AC
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]ADEMod:SQUelch[:STATe]

This command switches the squelch for the audio branch on or off.

Syntax: [SENSe:]ADEMod:SQUelch ON | OFF

Example: `"ADEM:SQU ON"`

Features: *RST value: OFF
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]ADEMod:SQUelch:LEVel

This command defines the switching threshold for the squelch referred to the measured signal.

Syntax: [SENSe:]ADEMod:SQUelch <numeric_value>
<numeric_value> := 30 to -150 dBm

Example: `"ADEM:SQU -10DBM"`

Features: *RST value: -40dBm
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]ADEMod:SBANd

This command selects the side band for the demodulation.

Syntax: [SENSe:]ADEMod:SBANd NORMal | INVerse
NORMal = normal position
INVerse = inverse position

Example: `"ADEM:SBAN INV"`

Features: *RST value: NORMal
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]ADEMod:RTIMe

This command selects whether the demodulation performed in real time or in blocks.

Syntax: [SENSe:]ADEMod:RTIMe ON | OFF

Example: `"ADEM:RTIM ON"`

Features: *RST value: ON
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

3.6.18.2 [SENSe:]AVERage Subsystem

The [SENSe:]AVERage subsystem calculates the average of the data acquired. A new test result is obtained from various successive measurements. The amount of test points and the axis reference of the new result correspond to those of the original measurements.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:AVERage			
:COUNt	<numeric_value>	--	
:AUTO	<Boolean>	--	
[:STATe]	<Boolean>	--	
:TYPE	MAXimum | SCALar	--	

[SENSe:]AVERage:COUNt

The command specifies the number of measurements which are combined.

Syntax: [SENSe:]AVERage:COUNt <numeric_value>
<numeric value> ::= 0 to 32767

Example: ":AVER:COUN 16"

Features: *RST value: 0
SCPI: conforming

[SENSe:]AVERage:COUNt:AUTO

AUTO ON selects a suitable number of :COUNt for the respective type of measurement.

Syntax: [SENSe:]AVERage:COUNt:AUTO ON | OFF

Example: ":AVER:COUN:AUTO ON"

Features: *RST value: OFF
SCPI: conforming

[SENSe:]AVERage[:STATe]

The command switches on or off the average function.

Syntax: [SENSe:]AVERage[:STATe] ON | OFF

Example: ":AVER OFF"

Features: *RST value: OFF
SCPI: conforming

[SENSe:]AVERage:TYPE

The command selects the type of average function.

Syntax: [SENSe:]AVERage:TYPE MAXimum | SCALar

Example: ":AVER:TYPE SCAL"

Features: *RST value: SCALar
SCPI: conforming

The following average functions have been defined:

MAXimum: $AVG(n) = MAX(X_1 \text{ to } .X_n)$

SCALar: $$AVG(n) = \frac{1}{n} \times \sum_{i=1}^{n} xi$$

3.6.18.3 SENSe:BANDwidth Subsystem

This subsystem controls the setting of the analyzer's filter bandwidths. Both groups of commands (BANDwidth and BWIDth) perform the same functions.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:BANDwidth			
[:RESolution]	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:MODE	ANALogIDIGital	--	
:FFT	<Boolean>	--	option FFT Filter
:VIDeo	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:RATio	<numeric_value> I SINe I PULSe I NOISe	--	
:DEMod	<numeric_value>	HZ	option Vector Signal Analysis
:PLL	AUTO I HIGH I MEDium I LOW		
:BWIDth			
[:RESolution]	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:MODE	ANALogIDIGital	--	option FFT Filter
:FFT	<Boolean>	--	
:VIDeo	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:DEMod	<numeric_value>	HZ	option Vector Signal Analysis
:PLL	AUTO I HIGH I MEDium I LOW		

[SENSe:]BANDwidthIBWIDth[:RESolution]

This command defines the analyzer's resolution bandwidth.

Syntax: [SENSe:]BANDwidthIBWIDth[:RESolution] <numeric_value>
<numeric_value>::= 10 Hz to 10 MHz (model 20)
1 HZ to 10 MHz (model 30)

Example: `"BAND 1MHz"`

Features: *RST value: - (AUTO is set to ON)
SCPI: conforming

The values for the resolution bandwidth are rounded in 1 I 2 I 3 I 5 steps. Bandwidths >1kHz are always analog bandwidths, bandwidths <1kHz are always realized digitally. For the bandwidth 1kHz, it is possible to select either analog or digital filters.

In the GSM BTS/MS ANALYZER mode with option FSE-K11/K10, the command is available for POWER vs. TIME measurement. In this case, the parameters DEFault (bandwidth setting according to GSM standard), 300KHZ and 1MHZ are permitted.

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO

This command either automatically couples the resolution bandwidth of the analyzer to the span or cancels the coupling.

Syntax: [SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO ON | OFF

Example: `"BAND:AUTO OFF"`

Features: *RST value: ON
SCPI: conforming

The automatic coupling matches the resolution bandwidth to the currently set span according to the relationship between span and resolution bandwidth.

[SENSe:]BANDwidth|BWIDth[:RESolution]:MODE

This command toggles between analog and digital resolution filters for the 1-kHz bandwidth.

Syntax: [SENSe:]BANDwidth|BWIDth[:RESolution]:MODE ANALog | DIGital

Example: `"BAND:MODE DIG"`

Features: *RST value: ANALog
SCPI: device-specific

Depending on the bandwidth, the resolution filters are automatically toggled between digital filters (<1kHz) and analog filters (>1kHz). The 1-kHz bandwidth is present in the instrument as a digital filter and as an analog filter and can be toggled using this command. If the analog filter is selected for the bandwidth 1kHz, the FFT-filtering for bandwidths ≤ 1kHz is switched off.

[SENSe:]BANDwidth|BWIDth[:RESolution]:MODE:FFT

This command toggles the digital filters used for bandwidths ≤ 1 kHz between ordinary mode and FFT-filter mode.

Syntax: [SENSe:]BANDwidth|BWIDth[:RESolution]:MODE:FFT ON | OFF

Example: `"BAND:MODE:FFT ON"`

Features: *RST value: OFF
SCPI: device-specific

The filter bandwidth of 1 kHz is switched to digital filtering for both ON and OFF. This command is only available in conjunction with option FFT Filter, FSE-B5.

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio

This command defines the ratio resolution bandwidth (Hz) / span (Hz).

Syntax: [SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <numeric_value>
<numeric_value>::= 0.0001 to 1

Example: `"BAND:RAT 0.1"`

Features: *RST value: -- (AUTO is set to ON)
SCPI: conforming

The ratio to be entered is reciprocal to the ratio Span/RBW used in manual control.

[SENSe:]BANDwidth|BWIDth:VIDeo

This command defines the analyzer's video bandwidth.

Syntax: [SENSe:]BANDwidth|BWIDth:VIDeo <numeric_value>
<numeric_value>::= 1Hz to 10MHz

Example: `"BAND:VID 10kHz"`

Features: *RST value: - (AUTO is set to ON)
SCPI: conforming

The values for the video bandwidth are rounded in 1 | 2 | 3 | 5 steps.

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO

This command either automatically couples the analyzer's video bandwidth to the resolution bandwidth or cancels the coupling.

Syntax: [SENSe:]BANDwidth|BWIDth:VIDeo:AUTO ON | OFF

Example: `"BAND:VID:AUTO OFF"`

Features: *RST value: ON
SCPI: conforming

[SENSe:]BANDwidth|BWIDth:VIDeo:RATIO

This command defines the ratio video bandwidth (Hz) / resolution bandwidth (Hz).

Syntax: [SENSe:]BANDwidth|BWIDth:VIDeo <numeric_value> | SINe | PULSe | NOISe
<numeric_value>::= 0.001 to 1000
The parameters SINe, PULSe and NOISe may be used as synonyms for the following values: SINe: 1 PULSe: 10 NOISe:0.1

Example: `"BAND:VID:RAT 10"`

Features: *RST value: - (AUTO is set to ON)
SCPI: conforming

The ratio to be entered is reciprocal to the ratio RBW/VBW used in manual control.

[SENSe:]BANDwidth|BWIDth:DEMod

This command defines the demodulation bandwidth of the analyzer for analog demodulation.

Syntax: [SENSe:]BANDwidth|BWIDth:DEMod <numeric_value>
<numeric_value>::= 5 kHz to 200 kHz (Real Time on)
5 kHz to 5 MHz (Real Time off)

Example: `"BAND:DEM 100KHZ"`

Features: *RST value: 10KHZ
SCPI: device-specific

The values for the demodulation bandwidth are rounded in steps of 1 | 2 | 3 | 5. The command is valid only in conjunction with option Vector Signal Analysis, FSE-B7, and for analog demodulation.

[SENSe:]BANDwidth|BWIDth:PLL

This command defines the bandwidth of the main PLL of the analyzer synthesizer.

Syntax: [SENSe:]BANDwidth|BWIDth:PLL AUTO|HIGH|MEDium|LOW

Example: `"BAND:PLL HIGH"`

Features: *RST value: AUTO
SCPI: device-specific

3.6.18.4 SENSe:CORRection-Subsystem

The SENSe:CORRection-subsystem controls the correction of measured results by means of frequency-dependent correction factors (e. g. for antenna or cable attenuation).
It also controls calibration and normalization during operation with the option tracking generator (FSE-B8 to FSE-B11).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:CORRection			option Tracking Generator
:METHod	TRANsmission I REFLexion		
:COLLect			
[:ACQuire]	THRough I OPEN		no query
[:STATe]	<Boolean>		
:RECall			no query
:TRANsducer			
:SELect	<name>		
:UNIT	<string>		
:SCALing	LINear I LOGarithmic		
:DATA	<freq> , <level> ..	HZ , --	
[:STATe]	<Boolean>		
:DELete	--	--	no query
:TSET			
:SELect	<name>		
:UNIT	<string>		
:RANGe<1 to 10>	<freq> , <freq>, <name> ..	HZ, HZ, --	
[:STATe]	<Boolean>		
:DELete	--	--	no query
:LOSS			option FSE-K11 or FSE-K10
:INPut			
[:MAGNitude]	<numeric_value>	DB	
:RXGain			option FSE-K11
:INPut			
[:MAGNitude]	<numeric_value>	DB	

[SENSe:]CORRection[:STATe]

This command activates/deactivates normalization of the measurement results.

Syntax: [SENSe:]CORRection[:STATe] ON I OFF

Example: `"CORR ON "`

Features: *RST value: OFF
SCPI: conforming

This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B12.

[SENSe:]CORRection:METHod

This command selects the kind of measurement with active tracking generator (transmission/reflexion).

Syntax: [SENSe:]CORRection:METHod TRANsmission | REFLexion

Example: `"CORR:METH TRAN "`

Features: *RST value: TRANsmission
SCPI: device specific

This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B12.

[SENSe:]CORRection:COLLect[:ACQuire]

This command selects the kind of measurement for the reference values of the normalization (response calibration).

Syntax: [SENSe:] CORRection:COLLect[:ACQuire] THRough | OPEN

Example: `"CORR:COLL THR"`

Features: *RST value:
SCPI: conforming

THRough "TRANsmission" mode: calibration with direct connection between tracking generator and device input.
"REFLexion" mode: calibration with short circuit at the input

OPEN only valid in "REFLexion" mode:calibration with open input

This command is an event which is why it is not assigned an *RST value an a query. It is only valid in conjunction with option Tracking Generator, FSE-B8 to B12.

[SENSe:]CORRection:RECall

This command restores the instrument setting that was valid for the measurement of the reference data. It is only valid in conjunction with option Tracking Generator, FSE-B8 to B12.

Syntax: [SENSe:] CORRection:RECall

Example: `"CORR:REC"`

Features: *RST value: -
SCPI: conforming

This command is an event which is why it is not assigned an *RST value and a query. It is only valid in conjunction with option Tracking Generator, FSE-B8 to B12.

[SENSe:]CORRection:TRANsducer:SELect

This command selects the transducer factor designated by <name>. If <name> does not exist yet, a new transducer factor is created.

Syntax: [SENSe:]CORRection:TRANsducer:SELect <name>
<name>::= Name of the transducer factor in string data form with a maximum of 8 characters.

Example: `"CORR:TRAN:SEL 'FACTOR1'"`

Features: *RST value: -
SCPI: device-specific

This command must be sent prior to the subsequent commands for modifying/activating transducer factors.

[SENSe:]CORRection:TRANsducer:UNIT

This command defines the unit of the transducer factor selected.

Syntax: [SENSe:]CORRection:TRANsducer:UNIT <string>
<string>::= 'DB' | 'DBM' | 'DBMV' | 'DBUV' | 'DBUV/M' | 'DBUA' 'DBUA/M' | 'DBPW' | 'DBPT'

Example: `"CORR:TRAN:UNIT 'DBUV'"`

Features: *RST value: 'DB'
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

[SENSe:]CORRection:TRANsducer:SCALing

This command defines whether the frequency scaling of the transducer factor is linear or logarithmic.

Syntax: [SENSe:]CORRection:TRANsducer:SCALing LINear|LOGarithmic

Example: `"CORR:TRAN:SCAL LOG"`

Features: *RST value: LINear
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

[SENSe:]CORRection:TRANsducer:DATA

This command defines the test points for the selected transducer factor. The values are entered as a series of frequency/level pairs. The frequencies must be in ascending order.

Syntax: [SENSe:]CORRection:TRANsducer:DATA <freq>,<level>..

Example: `"CORR:TRAN:TRANsducer:DATA 1MHZ,-30,2MHZ,-40"`

Features: *RST value: -
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent. The level values are sent as dimensionless numbers; the unit is specified by means of the command `SENS:CORR:TRAN:UNIT`.

[SENSe:]CORRection:TRANsducer[:STATe]

This command switches the selected transducer factor on or off.

Syntax: [SENSe:]CORRection:TRANsducer[:STATe] ON | OFF

Example: `"CORR:TRAN ON"`

Features: *RST value: OFF
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

[SENSe:]CORRection:TRANsducer:DELete

This command deletes the selected transducer factor.

Syntax: [SENSe:]CORRection:TRANsducer:DELete

Example: `"[SENSe:]CORR:TRAN:DEL"`

Features: *RST value: -
SCPI: device-specific

This command is an event and therefore has no *RST value.
Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

[SENSe:]CORRection:TSET:SELect

This command selected the transducer set designated by <name>. If <name> does not exist yet, a new set is created.

Syntax: [SENSe:]CORRection:TSET:SELect <name>
<name>::= name of the transducer set in string data form with a maximum of 8 characters.

Example: `"CORR:TSET:SEL 'SET1'"`

Features: *RST value: -
SCPI: device-specific

This command must be sent prior to the subsequent commands for changing/activating the transducer sets.

[SENSe:]CORRection:TSET:UNIT

This command defines the unit of the selected transducer sets. When assigning transducer factors to the set, only factors which are compatible to the selected unit, i. e. factors with the same unit or the unit dB, are allowed.

Syntax: [SENSe:]CORRection:TSET:UNIT <string>
<string>::= 'DB' | 'DBM' | 'DBUV' | 'DBUV/M' | 'DBUA' 'DBUA/M" | DBPW' | 'DBPT'

Example: `"CORR:TSET:UNIT 'DBUV'"`

Features: *RST value: 'DB'
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TSET:SEL` must be sent.

[SENSe:]CORRection:TSET:RANGe<1 to 10>

This command defines a partial range of the selected transducer set. The partial range is determined by its start and stop frequencies plus a list of names of the assigned transducer factors. The ranges 1 to 10 must be sent in ascending order.

Syntax: [SENSe:]CORRection:TSET:RANGe<1 to 10> <freq>,<freql>,<name>..
<freq>,<freq>::= start frequency, stop frequency of the range
<name>...::= list of names for the assigned transducer factors. The individual names must be characterized by single quotation marks (') and separated by commas.

Example: `"CORR:TRAN:TSET:RANG 1MHZ,2MHZ,'FACTOR1,'FACTOR2'"`

Features: *RST value: -
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TSET:SEL` must be sent.

[SENSe:]CORRection:TSET[:STATe]

This command switches the selected transducer set on or off.

Syntax: [SENSe:]CORRection:TSET[:STATe] ON | OFF

Example: `"CORR:TSET ON"`

Features: *RST value: OFF
SCPI: device-specific

Prior to this command, the command `SENS:CORR:TSET:SEL` must be sent.

[SENSe:]CORRection:TSET:DELete

This command deletes the selected transducer set.

Syntax: [SENSe:]CORRection:TSET:DELete

Example: `"[SENSe:]CORR:TSET:DEL"`

Features: *RST value: -
SCPI: device-specific

This command is an event and thus has no *RST value assigned.
Prior to this command, the command `SENS:CORR:TSET:SEL` must be sent.

[SENSe:]CORRection:LOSS:INPut[:MAGNitude]

This command announces to the instrument a possibly needed external attenuation of the input signal, so that it is taken into account later when the level is set.

Syntax: [SENSe:]CORRection:LOSS:INPut[:MAGNitude] <numeric_value>
with <numeric_value>::= value of external attenuation in dB.

Example: `"[SENSe:]CORR:LOSS:INP 30DB "`

Features: *RST value: 20dB
SCPI: device-specific

The external attenuation must be selected such that the input power of the analyzer does not exceed 27 dBm.
The command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

[SENSe:]CORRection:RXGain:INPut[:MAGNitude]

This command announces to the instrument a possibly needed preamplification in the RX-band (RX BAND GAIN), so that it is taken into account later when the measured values are read out.

Syntax: [SENSe:]CORRection:RXGain:INPut[:MAGNitude] <numeric_value>
with <numeric_value>::= value of the amplification in dB.

Example: `"[SENSe:]CORR:RXG:INP 30DB "`

Features: *RST value: 0 dB
SCPI: device-specific

The command is available only in conjunction with options GSM BTS/MS Analyzer, FSE-K11/K10, and for spurious emission or modulation spectrum measurement (K11 only).

3.6.18.5 SENSe:DETector Subsystem

The SENSe:DETector subsystem controls the recording of measurement values via the type of detector selected for each trace.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe] :DETector [:FUNCtion]	APEak I NEGativeI POSitive I SAMPIeI RMS I AVERage	--	
:AUTO	<Boolean>		

[SENSe:]DETector[:FUNCtion]

This command switches the detector for recording of the measured value.

Syntax: [SENSe:]DETector[:FUNCtion] APEak INEGative I POSitive I SAMPIe I RMS I AVERage

Example: `"DET POS"`

Features: *RST value: APEak
SCPI: conforming

The value "APEak" (AutoPeak) displays both the positive peak value and the negative peak value when noise is present. The positive peak value is displayed when one signal is present.

[SENSe:]DETector[:FUNCtion]:AUTO

This command either couples the detector to the current trace setting or turns coupling off.

Syntax: [SENSe:]DETector[:FUNCtion]:AUTO ON I OFF

Example: `"DET:AUTO OFF"`

Features: *RST value: ON
SCPI: conforming

3.6.18.6 SENSe:DDEMod Subsystem

This subsystem controls the parameters for digital demodulation and is only active in conjunction with operating mode Vector Signal Analysis (option FSE-B7).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:DDEMod			Vector Signal Analysis
:FORMat	QPSK | PSK | MSK | QAM | FSK		
:SBANd	NORMal | INVerse		
:QPSK			
:FORMat	NORMal | DIFFerential | OFFSet | DPI4		
:PSK			
:NSTate	2 | 8		
:FORMat	NORMal | DIFFerential		
:MSK			
:FORMat	TYPE1 | TYPE2 | NORMal | DIFFerential		
:QAM			
:NSTate	16		
:FSK			
:NSTate	2 | 4		
:SRATe	<numeric_value>	HZ	
:TIMe	<numeric_value>	SYM	
:PRATe	1 | 2 | 4 | 8 | 16		
:FILTer			
:MEASurement	OFF | RCOSine | RRCosine | GAUSsian		
:REFerence	RCOSine | RRCosine | GAUSsian		
:ALPHa	<numeric_value>		
:NORMalize	<Boolean>		
:PRESet	GSM | TETRa | DCS1800 | PCS1900 | PHS | PDCup | PDCDown | APCO25CQPSK | APCO25C4FM | CDPD | DECT | CT2 | ERMes | MODacom | PWT | TFTS | F16 | F322 | F324 | F64 | FQCDma | RQCDma | FNADc | RNADc		
:SEARch			
:PULSe			
:STATe	<Boolean>		
:SYNC			
:OFFSet	<numeric_value>	SYM	
:PATTern	<string>		
:STATe	<Boolean>		
:TIME	<numeric value>	SYM	
:TCAPture			Vector Signal Analysis
:LENGth	<numeric_value>		

[SENSe:]DDEMod:FORMat

This command selects the digital demodulation type.

Syntax: [SENSe:]DDEMod:FORMat QPSK | PSK | MSK | QAM | FSK

Example: "DDEM:FORM QPSK"

Features: *RST value: MSK
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SBANd

This command selects the sideband for the demodulation.

Syntax: [SENSe:]DDEMod:SBANd NORMal | INVerse
NORMal = normal position
INVerse = inverse position

Example: "DDEM:SBAN INV"

Features: *RST value: NORMal
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:QPSK:FORMat

This command determines the specific demodulation type for QPSK.

Syntax: [SENSe:]DDEMod:QPSK:FORMat NORMal | DIFFerential | OFFSet | DPI4

Example: "DDEM:QPSK:FORM DPI4"

Features: *RST value: -
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:PSK:NSTate

This command determines the specific demodulation type for PSK.

Syntax: [SENSe:]DDEMod:PSK:NSTate 2 | 8

Example: "DDEM:PSK:NST 2"

Features: *RST value: -
SCPI: device-specific

Value 2 (i.e. PSK2) corresponds to BPSK demodulation, value 8 the 8PSK demodulation. This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:PSK:FORMat

This command determines the specific demodulation type for PSK.

Syntax: [SENSe:]DDEMod:PSK:FORMat NORMal | DIFFerential

Example: "DDEM:PSK:FORM DIFF"

Features: *RST value: -
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:MSK:FORMat

This command determines the specific demodulation type for MSK.

Syntax: [SENSe:]DDEMod:MSK:FORMat TYPE1 | TYPE2 | NORMal | DIFFerential

Example: `"DDEM:MSK:FORM TYPE2"`

Features: *RST value: TYPE2 | DIFFerential
SCPI: device-specific

`TYPE1 | NORMal` corresponds to MSK demodulation, `TYPE2 | DIFFerential` corresponds to DMSK demodulation. This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:QAM:NSTate

This command determines the specific demodulation type for QAM.

Syntax: [SENSe:]DDEMod:QAM:NSTate 16

Example: `"DDEM:QAM:NST 16"`

Features: *RST value: 16
SCPI: device-specific.

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:FSK:NSTate

This command determines the specific demodulation type for FSK.

Syntax: [SENSe:]DDEMod:FSK:NSTate 2 | 4

Example: `"DDEM:FSK:NST 2"`

Features: *RST- value: -
SCPI: device-specific

The parameter 2 corresponds to the demodulation type 2FSK, the parameter 4 to the demodulation type 4FSK.This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SRATe

This command defines the symbol rate.

Syntax: [SENSe:]DDEMod:SRATe <numeric_value>
<numeric value> ::= 160 Hz to 1.6 MHz

Example: `"DDEM:SRAT 18kHz"`

Features: *RST value: 270.833333kHz
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:TIME

The command determines the number of displayed symbols (result length).

Syntax: [SENSe:]DDEMod:TIME <numeric_value>
<numeric value> ::= 1 to Frame Length

Example: `"DDEM:TIME 80"`

Features: *RST value: 147
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:PRATe

This command determines the number of points per symbol.

Syntax: [SENSe:]DDEMod:PRATe 1 | 2 | 4 | 8 | 16

Example: `"DDEM:PRAT 8"`

Features: *RST value: 4
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:FILTer:MEASurement

This command selects the input filter for the test signal.

Syntax: [SENSe:]DDEMod:FILTer:MEASurement
OFF | RCOSine | RRCosine | GAUSsian

Example: `"DDEM:FILT:MEAS RCOS"`

Features: *RST value: OFF
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:FILTer:REFerence

This command selects the input filter for the reference signal.

Syntax: [SENSe:]DDEMod:FILTer:REFerence
RCOSine | RRCosine | GAUSsian

Example: `"DDEM:FILT:REF RCOS"`

Features: *RST value: GAUSsian
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:FILTer:ALPHa

This command determines the filter characteristic (ALPHA/BT).

Syntax: [SENSe:]DDEMod:FILTer:ALPHa <numeric_value>
<numeric_value>::= 0.2 to 1 (step width 0.05)

Example: `"DDEM:FILT:ALPH 0.5"`

Features: *RST value: 0.3
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:NORMalize

This command switches normalizing of the unit circle on or off using IQ offset.

Syntax: [SENSe:]DDEMod:NORMalize ON | OFF

Example: "DDEM:NORM OFF"

Features: *RST value: ON
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SEARch:PULSe:STATe

This command switches the signal burst search on or off.

Syntax: [SENSe:]DDEMod:SEARch:PULSe:STATe ON | OFF

Example: "DDEM:SEAR:PULS:STAT OFF"

Features: *RST value: ON
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SEARch:SYNC:OFFSet

This command defines the offset of the display with reference to the synchronization sequence.

Syntax: [SENSe:]DDEMod:SEARch:SYNC:OFFSET <numeric_value>

Example: "DDEM:SEAR:SYNC:OFFS 10SYM"

Features: *RST value: 0 SYM
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SEARch:SYNC:PATTern

This command defines the synchronization sequence.

Syntax: [SENSe:]DDEMod:SEARch:SYNC:PATTern <string>

Example: "DDEM:SEAR:SYNC:PATT "1101001"

Features: *RST value: ""
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SEARch:SYNC:STATe

This command switches the search for a synchronization sequence on or off.

Syntax: [SENSe:]DDEMod:SEARch:SYNC:STATe ON | OFF

Example: "DDEM:SEARch:SYNC:STAT ON"

Features: *RST value: OFF
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:SEARch:TIME

This command determines the number of symbols required for demodulation (frame length). The values > 800 are only permissible if the number of points per symbol is <16, the values > 1600 only if the number of points per symbol is <8.

Syntax: [SENSe:]DDEMod:SEARch:TIME 100 to 1600 (step width = 100)

Example: `"DDEM:SEAR:TIME 800"`

Features: *RST value: 400
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]DDEMod:PRESet

This command selects an automatic setting of all modulation parameters according to a standard transmission method.

Syntax: [SENSe:]DDEMod:PRESet GSM | TETRa | DCS1800 | PCS1900 | PHS | PDCup | PDCDown | APCO25CQPSK | APCO25C4FM | CDPD | DECT | CT2 | ERMes | MODacom | PWT | TFTS | F16 | F322 | F324 | F64 | FQCDma | RQCDmal FNADc | RNADc

Example: `"DDEM:PRES TETR"`

Features: *RST value: GSM
SCPI: device-specific

FQCDma	Forward CDMA according to IS95 standard
RQCDma	Reverse CDMA according to IS95 standard
F16	FLEX 1600 - 2FSK
F322	FLEX 3200 - 2FSK
F324	FLEX 3200 - 4FSK
F64	FLEX 6400 - 4FSK

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

[SENSe:]TCAPture:LENGth

This command determines the number of sampling points that are written into the memory for each measurement (memory size).

Syntax: [SENSe:]TCAPture:LENGth 1024 | 2048 | 4096 | 8192 | 16384

Example: `"TCAP:LENG 1024"`

Features: *RST value: 16384
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for digital demodulation.

3.6.18.7 SENSe:FILTer Subsystem

The SENSe:FILTer subsystem selects the filters in the video signal path. This subsystem is active only in the Vector Signal Analysis mode (option FSE-B7).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:FILTer			Vector Signal Analyzer
:HPASs			
[:STATe]	<Boolean>	--	
:FREQuency	<numeric_value>	HZ	
:LPASs			Vector Signal Analyzer
[:STATe]	<Boolean>	--	
:FREQuency	<numeric_value>	HZ | PCT	
:CCITt			
[:STATe]	<Boolean>	--	
:CMESsage			
[:STATe]	<Boolean>	--	
:DEMPhasis			
[:STATe]	<Boolean>		
:TCONstant	<numeric_value>	S	
:LINK	DISPlay | AUDio		

[SENSe:]FILTer:HPASs[:STATe]

This command activates the high-pass filter in the AF-branch for analog demodulation.

Syntax: [SENSe:]FILTer:HPASS[:STATe] ON | OFF

Example: `"FILT:HPAS ON"`

Features: *RST value: OFF
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:HPASs:FREQuency

In the Vector Signal Analysis mode with analog demodulation, this command defines the frequency limit of the high-pass filter in the AF-branch. For REAL TIME ON absolute frequencies are entered, for REAL TIME OFF, the frequencies are entered relative to the demodulation bandwidth.

Syntax: [SENSe:]FILTer:HPASs:FREQuency <numeric_value>
<numeric_value> ::= 10 Hz | 100 Hz | 1 kHz | 1 MHz (signal analysis)
30 Hz | 300 kHz (vector signal analysis)

Example:
```
"FILT:HPAS:FREQ 100HZ"
"FILT:HPAS:FREQ 30HZ"
```

Features: *RST value: - (STATe = OFF)
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:LPASs[:STATe]

This command activates the low-pass filter in the AF-branch with analog demodulation.

Syntax: [SENSe:]FILTer:LPASS[:STATe] ON | OFF

Example: "FILT:LPAS ON"

Features: *RST value: OFF
SCPI: conforming

On switching to ON, a bandwidth of 3 kHz for REAL TIME ON and a bandwidth of 5 PCT for REAL TIME OFF is set automatically. This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:LPASs:FREQuency

This command defines the frequency limit of the low-pass filter in the NF-branch for analog demodulation.

Syntax: [SENSe:]FILTer:LPASs:FREQuency <numeric_value>
<numeric_value> ::= 3 kHz | 15 kHz bei REAL TIME ON
5 PCT | 10 PCT | 25 PCT bei REAL TIME OFF

Example: "FILT:LPAS:FREQ 3KHZ" for REAL TIME ON
"FILT:LPAS:FREQ 25PCT" for REAL TIME OFF

Features: *RST value: - (STATe = OFF)
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:CCITt[:STATe]

This command activates the weighting filter according to CCITT-recommendation in the AF-branch for analog demodulation.

Syntax: [SENSe:]FILTer:CCITt[:STATe] ON | OFF

Example: "FILT:CCIT ON"

Features: *RST value: OFF
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:CMESsage[:STATe]

This command activates the C-message weighting filter according to CCITT-recommendation in the AF-branch for analog demodulation.

Syntax: [SENSe:]FILTer:CMESsage[:STATe] ON | OFF

Example: "FILT:CMES ON"

Features: *RST value: OFF
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation with REAS TIME OFF.

[SENSe:]FILTer:DEMPhasis[:STATe]

This command activates the selected de-emphasis for analog demodulation.

Syntax: [SENSe:]FILTer:DEMPhasis[:STATe] ON | OFF

Example: `"FILT:DEMP ON"`

Features: *RST value: OFF
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:DEMPhasis:TCONstant

This command sets the time constant of the de-emphasis for analog demodulation.

Syntax: [SENSe:]FILTer:DEMPhasis:TCONstant 50US | 75US | 750US

Example: `"FILT:DEMP:TCON 75US"`

Features: *RST value: 50us
SCPI: conforming

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]FILTer:DEMPhasis:LINK

For analog demodulation, this command selects whether the de-emphasis set is to be active in the audio branch only or in addition for the display of measured values.

Syntax: [SENSe:]FILTer:DEMPhasis:LINK DISPlay | AUDio
AUDio::= De-emphasis effective in the audio branch only
DISPlay::= De-emphasis effective in the audio branch and in the display of measured values

Example: `"FILT:DEMP:LINK DISP"`

Features: *RST value: AUDio
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

3.6.18.8 SENSe:FREQuency Subsystem

The SENSe:FREQuency subsystem defines the frequency axis of the active display. The frequency axis can either be defined via the start/stop frequency or via the center frequency and span.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:FREQuency			
:CENTer	<numeric_value>	HZ	
:LINK	STARt I STOP I SPAN	--	
:STEP	<numeric_value>	HZ	
:LINK	SPAN I RBW I OFF	--	
:FACTor	<numeric_value>	PCT	
:SPAN	<numeric value>	HZ	
:FULL	--	--	
:LINK	CENTer I STARt I STOP	--	
:STARt	<numeric_value>	HZ	
:LINK	CENTer I STOP I SPAN	--	
:STOP	<numeric_value>	HZ	
:LINK	CENTer I STAR t ISPAN	--	
:MODE	CW I FIXed I SWEep	--	
:OFFSet	<numeric_value>	HZ	

[SENSe:]FREQuency:CENTer

This command defines the center frequency of the analyzer.

Syntax: [SENSe:]FREQuency:CENTer <numeric_value>
<numeric_value>::= 0 GHz to f_{max}

Example: `"FREQ:CENT 100MHz"`

Features: *RST value: f_{max} / 2
SCPI: conforming

The automatic coupling of the parameters is set to SPAN FIXED.

[SENSe:]FREQuency:CENTer:LINK

This command defines the coupling of the center frequency to the start, stop frequency or the frequency span.

Syntax: [SENSe:]FREQuency:CENTer:LINK STARt I STOP I SPAN

Example: `"FREQ:CENT:LINK STAR"`

Features: *RST value: SPAN
SCPI: device-specific

[SENSe:]FREQuency:CENTer:STEP

This command defines the step width of the center frequency.

Syntax: [SENSe:]FREQuency:CENTer:STEP <numeric_value>
<numeric_value>::= 0 to f_{max}

Example: `"FREQ:CENT:STEP 120MHz"`

Features: *RST value: - (AUTO 0.1 x SPAN is switched on)
SCPI: conforming

[SENSe:]FREQuency:CENTer:STEP:LINK

This command couples the step width of the center frequency to span (span >0) or to the resolution bandwidth (span = 0) or cancels the couplings.

Syntax: [SENSe:]FREQuency:CENTer:STEP:LINK SPAN | RBW | OFF

Example: `"FREQ:CENT:STEP:LINK SPAN"`

Features: *RST value: SPAN
SCPI: device-specific

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor

This command couples the step width of the center frequency with a factor to the span (span >0) or to the resolution bandwidth (span = 0).

Syntax: [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <numeric_value>
<numeric_value>::= 1 to 100 PCT

Example: `"FREQ:CENT:STEP:LINK:FACT 20PCT"`

Features: *RST value: - (AUTO 0.1 x SPAN is switched on)
SCPI: device-specific

[SENSe:]FREQuency:SPAN

This command defines the frequency span of the analyzer.

Syntax: [SENSe:]FREQuency:SPAN <numeric_value>
<numeric_value>::= 0 GHz to f_{max}

Example: `"FREQ:SPAN 10MHz"`

Features: *RST value: f_{max}
SCPI: conforming

The automatic coupling of the parameters is set to CENTER FIXED.

[SENSe:]FREQuency:SPAN:FULL

This command sets the maximum frequency span of the analyzer.

Syntax: [SENSe:]FREQuency:SPAN:FULL

Example: `"FREQ:SPAN:FULL"`

Features: *RST value: -
SCPI: conforming

This command is an event which is why it is not assigned an *RST value and has no query.

[SENSe:]FREQuency:SPAN:LINK

This command defines the coupling for frequency-span changes.

Syntax: [SENSe:]FREQuency:SPAN:LINK CENTer | START | STOP

Example: `"FREQ:SPAN:LINK STOP"`

Features: *RST value: CENTer
SCPI: conforming

[SENSe:]FREQuency:STARt

This command defines the start frequency of the analyzer.

Syntax: [SENSe:]FREQuency:STARt <numeric_value>
<numeric_value>::= 0 GHz to f_{max}

Example: `"FREQ:STAR 20MHz"`

Features: *RST value: 0
SCPI: conforming

The automatic coupling of the parameters is set to STOP FIXED.

[SENSe:]FREQuency:STARt:LINK

This command defines the coupling for start-frequency changes.

Syntax: [SENSe:]FREQuency:STARt:LINK CENTer | STOP | SPAN

Example: `"FREQ:STAR:LINK SPAN"`

Features: *RST value: STOP
SCPI: device-specific

[SENSe:]FREQuency:STOP

This command defines the stop frequency of the analyzer.

Syntax: [SENSe:]FREQuency:STOP <numeric_value>
<numeric_value>::= 0 GHz to f_{max}

Example: `"FREQ:STOP 2000MHz"`

Features: *RST value: f_{max}
SCPI: conforming

The automatic coupling of the parameters is set to STARt FIXED.

[SENSe:]FREQuency:STOP:LINK

This command defines the coupling for stop-frequency changes.

Syntax: [SENSe:]FREQuency:STOP:LINK CENTer | STARt | SPAN

Example: `"FREQ:STOP:LINK SPAN"`

Features: *RST value: STARt
SCPI: device-specific

[SENSe:]FREQuency:MODE

This command determines which command groups are used for setting the frequency of the analyzer.

Syntax: [SENSe:]FREQuency:MODE CW | FIXed | SWEep

Example: "FREQ:MODE SWE"

Features: *RST value: SWE
SCPI: conforming

For CW and FIXed, the frequency setting is via command `FREQuency:CW`. In the SWEep mode, the setting is via commands `FREQuency:STARt`, `STOP`, `CENTer` and `SPAN`.

[SENSe:]FREQuency:OFFSet

This command defines the frequency offset of the analyzer.

Syntax: [SENSe:]FREQuency:OFFSet <numeric_value>

Example: `"FREQ:OFFS 1GHZ"`

Features: *RST value: 0 Hz
SCPI: conforming

3.6.18.9 SENSe:MSUMmary Subsystem

This subsystem controls the modulation marker setting for analog demodulation. It is active only in conjunction with option Vector Analysis, FSE-B7.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:MSUMmary			Vector Signal Analysis
:AHOLd			
[:STATe]	<Boolean>		
:MODE	ABSolute | RELative		
:REFerence	<numeric_value>	PCT | HZ | DEG | RAD	
:AUTO	ONCE		no query
:MTIMe	<numeric_value>	S	

[SENSe:]MSUMmary:AHOLd[:STATe]

This command switches on the average/peak hold mode.

Syntax: [SENSe:]MSUMmary:AHOLd[:STATe]ON | OFF

Example: `"MSUM:AHOL ON"`

Features: *RST value: OFF
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]MSUMmary:MODE

This command selects the absolute or relative indication of the summary marker values.

Syntax: [SENSe:]MSUMmary:MODE ABSolute | RELative

Example: `"MSUM:MODE REL"`

Features: *RST value: ABSolute
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]MSUMmary:REFerence

This command selects the reference modulation.

Syntax: [SENSe:]MSUMmary:REFerence <numeric_value>
<numeric_value> :=
0.001PCT to 1000PCT for AM
0.1HZ to 10MHZ for FM
0.0001RAD to 1000RAD for PM

Example: `"MSUM:REF 50PCT"`

Features: *RST value: 100PCT for AM
100KHZ for FM
10RAD for PM
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]MSUMmary:REFerence:AUTO

This command sets the current absolute measured values of the main modulation signal as reference values for the relative indication.

Syntax: [SENSe:]MSUMmary:REFerence:AUTO ONCE

Example: `"MSUM:REF:AUTO ONCE"`

Features: *RST value: --
SCPI: device-specific

This command is an event and has therefore no query and no *RST value assigned. This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

[SENSe:]MSUMmary:MTIMe

This command selects the measurement time for the summary markers.

Syntax: [SENSe:]MSUMmary:MTIMe <numeric_value>
<numeric_value> := 0.1 s | 1 s

Example: `"MSUM:MTIM 100US"`

Features: *RST value: 0.1S
SCPI: device-specific

This command is valid only in the Vector Signal Analysis mode and for analog demodulation.

3.6.18.10 SENSe:POWer Subsystem

This subsystem controls the setting of the analyzer's power measurements.

COMMAND	PARAMETER	UNIT	COMMENT
[SENSe<1|2>]			
:POWer			
:ACHannel			
:SPACing			
[:UPPer]	<numeric_value>	HZ	
:ACPairs	1 | 2 | 3		
:BANDwidth			
[:CHANnel]	<numeric_value>	HZ	
:ACHannel	<numeric_value>	HZ	
:ALTernate<1|2>	<numeric_value>	HZ	
:BWIDth			
[:CHANnel]	<numeric_value>	HZ	
:ACHannel	<numeric_value>	HZ	
:ALTernate<1|2>	<numeric_value>	HZ	
:MODE	ABSolute | RELative		
:REFerence			
:AUTO	ONCE		no query
:PRESet	ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0		
:BANDwidth	<numeric_value>	PCT	
:BWIDth	<numeric_value>	PCT	

[SENSe:]POWer:ACHannel:SPACing[:UPPer]

This command defines the channel spacing of adjacent channel to carrier.

Syntax: [SENSe:]POWer:ACHannel:SPACing[:UPPer] <numeric_value>
<numeric_value>::= 0 Hz to 1000 MHz

Example: `"POW:ACH:SPAC 28kHz"`

Features: *RST value: 24 kHz
SCPI: conforming

[SENSe:]POWer:ACHannel:ACPairs

This command sets the number of adjacent channels (upper and lower channel in pairs).

Syntax: [SENSe:]POWer:ACHannel:ACPairs 1.| 2 | 3

Example: `"POW:ACH:ACP 3"`

Features: *RST value: 1
SCPI: device-specific

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel]

This command sets the channel bandwidth of the radio communication system.

Syntax: [SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel] <numeric_value>
<numeric_value>::= 0 Hz to 1000 MHz

Example: `"POW:ACH:BWID 30kHz"`

Features: *RST value: 24 kHz
SCPI: device-specific

If the channel bandwidth of the adjacent channel is changed the bandwiths of all alternate adjacent channels are automatically set to the same value.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel

This command defines the channel bandwidth of the adjacent channel of the radio transmission system.

Syntax: [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <numeric_value>
<numeric_value>::= 0 Hz to 1000 MHz

Example: `"POW:ACH:BWID:ACH 30kHz"`

Features: *RST value: 24 kHz
SCPI: device-specific

If the channel bandwidth of the adjacent channel is changed the bandwiths of all alternate adjacent channels are automatically set to the same value.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<1|2>

This command defines the channel bandwidth of the first/second alternate adjacent channel of the radio transmission system.

Syntax: [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<1|2>
<numeric_value>
<numeric_value>::= 0 Hz to 1000 MHz

Example: `"POW:ACH:BWID:ALT2 30kHz"`

Features: *RST value: 24 kHz
SCPI: device-specific

If the channel bandwidth of the alternate adjacent channel no. 1is changed the bandwith of the alternate adjacent channel no. 2 is automatically set to the same value.

[SENSe:]POWer:ACHannel:MODE

This command toggles between absolute and relative measurement.

Syntax: [SENSe:]POWer:ACHannel:MODE ABSolute | RELative

Example: `"POW:ACH:MODE REL"`

Features: *RST value: ABSolute
SCPI: device-specific

For the relative measurement the reference value is set to the currently measured channel power by command `POW:ACH:REF:AUTO ONCE`.

[SENSe:]POWer:ACHannel:REFerence:AUTO

This command sets the reference value to the currently measured channel power.

Syntax: [SENSe:]POWer:ACHannel:REFerence:AUTO ONCE

Example: `"POW:ACH:REF:AUTO ONCE"`

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

[SENSe:]POWer:ACHannel:PRESet

This command selects the type of power measurement.

Syntax: [SENSe:]POWer:ACHannel:PRESet
ACPower | CPOWer | OBANdwidth|OBWidth | CN | CN0

Example: `"POW:ACH:REF:PRES ACP"`

Features: *RST value: -
SCPI: device-specific

[SENSe:]POWer:BANDwidth|BWIDth

This command defines the percentage of the power with respect to the total power.

Syntax: [SENSe:]POWer:ACHannel:BANDwidth|BWIDth 0 to 100PCT

Example: `"POW:BWID 95PCT"`

Features: *RST value: 99PCT
SCPI: device-specific

This value defines the occupied bandwidth (measurement `POW:ACH:PRES OBW`).

3.6.18.11 SENSe:ROSCillator Subsystem

This subsystem controls the reference oscillator.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:ROSCillator			
:SOURce	INTernal | EXTernal	--	
:EXTernal			
:FREQuency	<numeric_value>	HZ	
[:INTernal]			
:TUNe	<numeric_value>		
:SAVe			no query

[SENSe:]ROSCillator:SOURce

This command controls selection of the reference oscillator.

Syntax: [SENSe:]ROSCillator:SOURce INTernal | EXTernal

Example: `"ROSC:SOUR EXT"`

Features: *RST value: –
SCPI: conforming

If the external reference oscillator is selected, the reference signal must be connected to the rear panel of the instrument.

[SENSe:]ROSCillator:EXTernal:FREQuency

This command defines the frequency of the external reference oscillator.

Syntax: [SENSe:]ROSCillator:EXTernal:FREQuency <numeric_value>
<numeric_value>::= 1MHz to 16MHz

Example: `"ROSC:EXT:FREQ 5MHz"`

Features: *RST value: 10MHz
SCPI: conforming

The value of the external reference frequency (1MHz to 16MHz) is rounded in steps of 1MHz.

[SENSe:]ROSCillator[:INTernal]:TUNe

This command defines the value for the tuning of the internal reference oscillator.

Syntax: [SENSe:]ROSCillator[:INTernal]:TUNe <numeric_value>
<numeric_value>::= 0 to 4095

Example: `"ROSC:TUN 128"`

Features: *RST value: –
SCPI: device-specific

The reference oscillator should be tuned only if an error has been detected in the frequency accuracy check. After PRESET or switching on the FSE, the saved value of the reference frequency is restored.

[SENSe:]ROSCillator[:INTernal]:TUNe:SAVe

This command saves the new value for the tuning of the internal reference oscillator. The factory-set value in the EEPROM is overwritten.

Syntax: [SENSe:]ROSCillator[:INTernal]:TUNe:SAVe

Example: `"ROSC:TUN:SAV"`

Features: *RST value: –
SCPI: device-specific

3.6.18.12 SENSe:SWEep Subsystem

This subsystem controls the sweep parameters.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:SWEep			
:TIME	<numeric_value>	S	
:AUTO	<Boolean>	--	
:COUNt	<numeric_value>	--	
:EGATe	<Boolean>	--	
:LEVel	<numeric_value>	V	
:TYPE	LEVel | EDGE	--	
:POLarity	POSitive|NEGative	--	
:HOLDoff	<numeric_value>	S	
:LENGth	<numeric_value>	S	
:SOURce	EXTernal | RFPower	--	
:GAP	<Boolean>	--	
:PRETrigger	<numeric_value>	S	
:TRGTogap	<numeric_value>	S	
:LENGth	<numeric_value>	S	

[SENSe:]SWEep:TIME

This command defines the duration of the sweep.

Syntax: [SENSe:]SWEep:TIME <numeric_value>
<numeric_value>::= 5 ms to 1000 s

Example: `"SWE:TIME 10s"`

Features: *RST value - (AUTO is set to ON)
SCPI: conforming

If `SWEep:TIME` is directly programmed, automatic coupling is switched off.

[SENSe:]SWEep:TIME:AUTO

This command switches the automatic coupling of the sweep time for the frequency span or bandwidth settings.

Syntax: [SENSe:]SWEep:TIME:AUTO ON | OFF

Example: `"SWE:TIME:AUTO ON"`

Features: *RST value: ON
SCPI: conforming

If `SWEep:TIME` is directly programmed, automatic coupling is switched off.

[SENSe:]SWEep:COUNt

This command defines the number of sweeps started with single sweep.

Syntax: [SENSe:]SWEep:COUNt <numeric_value>
<numeric_value>::= 0 to 32767

Example: `"SWE:COUNT 64"`

Features: *RST value: 0
SCPI: conforming

This parameter defines the number of sweeps or the number of averaging procedures. In the average mode, the value 0 defines a running averaging of measurement data over 10 sweeps.

[SENSe:]SWEep:EGATe

This command controls the sweep with the external gate signal.

Syntax: [SENSe:]SWEep:EGATe ON | OFF

Example: `"SWE:EGAT ON"`

Features: *RST value: OFF
SCPI: device-specific

[SENSe:]SWEep:EGATe:LEVel

This command determines the threshold for the external gate signal.

Syntax: [SENSe:]SWEep:EGATe:LEVel <numeric_value>
<numeric_value>::= -5V to +5V

Example: `"SWE:EGAT:LEV 3V"`

Features: *RST value: 2V
SCPI: device-specific

If `SWEep:TIME` is directly programmed, automatic coupling is switched off.

[SENSe:]SWEep:EGATe:TYPE

This command sets the type of triggering (level or edge) by the external gate signal.

Syntax: [SENSe:]SWEep:EGATe:TYPE LEVel | EDGE

Example: `"SWE:EGAT:TYPE EDGE"`

Features: *RST value: EDGE
SCPI: device-specific

Parameter `EGATe:LENGth` is not used for level triggering.

[SENSe:]SWEep:EGATe:POLarity

This command determines the polarity of the external gate signal.

Syntax: [SENSe:]SWEep:EGATe:POLarity POSitive | NEGative

Example: `"SWE:EGAT:POL POS"`

Features: *RST value: POSitive
SCPI: device-specific

[SENSe:]SWEep:EGATe:HOLDoff

This command defines the delay time between the external gate signal and the continuation of the sweep.

Syntax: [SENSe:]SWEep:EGATe:HOLDoff <numeric_value>
<numeric_value>::= 0 to 100s

Example: `"SWE:EGAT:HOLD 100us"`

Features: *RST value: 0s
SCPI: device-specific

The values for the delay time can be set in steps 1, 2, 3 and 5.

[SENSe:]SWEep:EGATe:LENGth

In case of edge triggering, this command determines the time interval in which the analyzer sweeps.

Syntax: [SENSe:]SWEep:EGATe:LENGth <numeric_value>
<numeric_value>::= 0 to 100s

Example: `"SWE:EGAT:LENG 10ms"`

Features: *RST value: 0s
SCPI: device-specific

The values for the delay time can be set in steps 1, 2, 3 and 5.

[SENSe:]SWEep:EGATe:SOURce

This command toggles between external gate signal and RF power signal.

Syntax: [SENSe:]SWEep:EGATe:SOURce EXTernal | RFPower

Example: `"SWE:EGAT:SOUR RFP"`

Features: *RST value: EXTernal
SCPI: device-specific

[SENSe:]SWEep:GAP

This command controls the operating mode GAP SWEEP.

Syntax: [SENSe:]SWEep:GAP ON | OFF

Example: "SWE:GAP ON"

Features: *RST value: OFF
SCPI: device-specific

Operating mode GAP SWEEP for measurements in the time domain controls the display of measured values. Measured values can be blanked for a defined time range (GAP).

[SENSe:]SWEep:GAP:PRETrigger

This command defines the evaluation time for measured values before the pretrigger time.

Syntax: [SENSe:]SWEep:GAP:PRETrigger <numeric_value>
<numeric_value>::= 0 to 100s (resolution: 50 ns)

Example: "SWE:GAP:PRET 100us"

Features: *RST value: 0s
SCPI: device-specific

[SENSe:]SWEep:GAP:TRGTogap

This command defines the time between the pretrigger time and the beginning of the gap (trigger-to-gap time)

Syntax: [SENSe:]SWEep:GAP:TRGTogap <numeric_value>
<numeric_value>::= 0 to 100s (resolution: 50 ns)

Example: "SWE:GAP:TRGT 50us"

Features: *RST value: 0s
SCPI: device-specific

[SENSe:]SWEep:GAP:LENGth

This command defines the gap length.

Syntax: [SENSe:]SWEep:GAP:LENGth <numeric_value>
<numeric_value>::= 0 to 100s

Example: "SWE:GAP:LENG 400us"

Features: *RST value: 0s
SCPI: device-specific

The gap length can be programmed from 0 to 100s in steps of 1, 2, 3 and 5.

3.6.18.13 SENSe:TV Subsystem

This subsystem controls the optional TV-demodulator (only in conjunction with option TV-Demodulator, FSE-B3).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe]			
:TV			Option TV-Demodulator
[:STATe]	<Boolean>	--	
:PSOFfset	<numeric_value>	HZ	

[SENSe:]TV[:STATe]

This command switches the optional TV-demodulator on or off.

Syntax: [SENSe:]TV[:STATe] ON | OFF

Example: `"TV ON"`

Features: *RST value: OFF
SCPI: device-specific

This command is available only in conjunction with option TV-Demodulator, FSE-B3.

[SENSe:]TV:PSOFfset

This command defines the frequency offset between video and audio carrier of the measured signal.

Syntax: [SENSe:]TV:PSOFfset <numeric_value>
<numeric_value>::= 0 to 6.5 MHz

Example: `"TV:PSOF 1 MHz"`

Features: *RST value: 5 MHz
SCPI: device-specific

This command is available only in conjunction with option TV-Demodulator, FSE-B3.

3.6.19 SOURce Subsystem

The SOURce subsystem controls the output signals of the analyzer when the option Tracking Generator is installed (FSE-B8 to FSE-B11). In the split screen mode, a distinction is made between SOURce1 (screen A) and SOURce2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
SOURce<1|2>			Option Mitlaufgenerator
:AM			
:STATe	<Boolean>		
:DM			
:STATe	<Boolean>		
:FM			
:STATe	<Boolean>		
:FREQuency			
:OFFSet	<numeric_value>	HZ	
:POWer			
:ALC			
:SOURce	INTernal | EXTernal		
[:LEVel]			
[:IMMediate]			
[:AMPLitude]	<numeric_value>	DBM	
:OFFSet	<numeric_value>	DB	

SOURce<1|2>:AM:STATe

This command switches on or off the external amplitude modulation of the tracking generator.

Syntax: SOURce:AM:STATe ON | OFF

Example: "SOUR:AM:STAT ON "

Features: *RST-value: OFF
SCPI: conforming

External ALC and external I/Q-modulation is switched off, if active.

This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

SOURce<1|2>:DM:STATe

This command switches on or off the external delta modulation of the tracking generator.

Syntax: SOURce:DM:STATe ON | OFF

Example: "SOUR:DM:STAT ON "

Features: *RST- value: OFF
SCPI: conforming

External AM, external ALC, external FM and external frequency offset are switched off, if active.

This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

SOURce<1|2>:FM:STATe

This command switches on or off the external frequency modulation of the tracking generator.

Syntax: SOURce:FM:STATe ON | OFF

Example: `"SOUR:FM:STAT ON "`

Features: *RST-value: OFF
SCPI: conforming

External AM, external I/Q-modulation and frequency offset are switched off, if active. This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

SOURce<1|2>:FREQuency:OFFSet

This command defines a frequency offset of the tracking generators to the current analyzer frequency.

Syntax: SOURce:FREQuency:OFFSet <numeric value>
<numeric value>::= -200MHz to 200MHz

Example: `"SOUR:FREQ:OFFS "`

Features: *RST-value: 0 Hz
SCPI: conforming

External delta modulation is switched off, if active. This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

SOURce<1|2>:POWer:ALC:SOURce

This command switches on or off the external level control (ALC).

Syntax: SOURce:POWer:ALC:SOURce INTernal | EXTernal

Example: `"SOUR:POW:ALC:SOUR INT "`

Features: *RST- value: INT
SCPI: conforming

External AM and external delta modulation are switched off, if active. This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

SOURce<1|2>:POWer[:LEVel][:IMMediate][:AMPLitude]

This command defines the level of the tracking generator.

Syntax: SOURce:POWer[:LEVel][:IMMediate][:AMPLitude] <numeric value>
<numeric value>::= -20dBm to 0dBm / Option FSE-B12: -90dBm to 0dBm

Example: `"SOUR:POW -20dBm"`

Features: *RST- value:
SCPI: conforming

This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

SOURce<1|2>:POWer[:LEVel][:IMMediate]:OFFSet

This command defines a level offset for the tracking generator.

Syntax: SOURce:POWer[:LEVel][:IMMediate]:OFFSet <numeric value>
<numeric value>::= -200dB to +200dB

Example: "SOUR:POW:OFFS -10dB"

Features: *RST- value: 0dB
SCPI: conforming

This command is only valid in conjunction with option Tracking Generator, FSE-B8 to B11

3.6.20 STATus Subsystem

The STATus subsystem contains the commands for the status reporting system (see Section 3.8, Status Reporting System"). *RST does not influence the status registers.

COMMAND	PARAMETERS	UNIT	COMMENT
STATus			
:OPERation			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:PRESet	--	--	
:QUEStionable			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:POWer			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:LIMit			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:LMARgin			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:SYNC			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:ACPLimit			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	

COMMAND	PARAMETERS	UNIT	COMMENT
STATus			
:QUEStionable	--	--	
:FREQuency	--	--	
[:EVENt?]	0 to 65535	--	
:CONDition?	0 to 65535	--	
:ENABle	0 to 65535	--	
:PTRansition	--	--	
:NTRansition	--	--	
:QUEue?			
[:NEXT?]			

STATus:OPERation[:EVENt?]

This command queries the contents of the EVENt section of the STATus:OPERation register.

Syntax: STATus:OPERation[:EVENt?]

Example: `"STAT:OPER?"`

Features: *RST value: –
SCPI: conforming

The contents of the EVENt section is deleted with readout.

STATus:OPERation:CONDition?

This command queries the CONDition section of the STATus:OPERation register.

Syntax: STATus:OPERation:CONDition?

Example: `"STAT:OPER:COND?"`

Features: *RST value: –
SCPI: conforming

Readout does not delete the contents of the CONDition section. The value returned reflects the current hardware status.

STATus:OPERation:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable register.

Syntax: STATus:OPERation:ENABle 0 to 65535

Example: `"STAT:OPER:ENAB 65535"`

Features: *RST value: –
SCPI: conforming

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:OPERation:PTRansition

This command sets the edge detectors of all bits of the STATus:OPERation register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:OPERation:PTRansition 0 to 65535

Example: `"STAT:OPER:PTR 65535"`

Features: *RST value: –
SCPI: conforming

STATus:OPERation:NTRansition

This command sets the edge detectors of all bits of the STATus:OPERation register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:OPERation:NTRansition 0 to 65535

Example: `"STAT:OPER:NTR 65535"`

Features: *RST value: –
SCPI: conforming

STATus:PRESet

This command resets the edge detectors and ENABle parts of all registers to a defined value. All PTRansition parts are set to FFFFh, i.e., all transitions from 0 to 1 are detected. All NTRansition parts are set to 0, i.e., a transition from 1 to 0 in a CONDition bit is not detected. The ENABle part of the STATus:OPERation and STATus:QUEStionable registers are set to 0, i.e., all events in these registers are not passed on.

Syntax: STATus:PRESet

Example: `"STAT:PRES"`

Features: *RST value: –
SCPI: conforming

STATus:QUEStionable[:EVENt?]

This command queries the contents of the EVENt section of the STATus:QUEStionable register.

Syntax: STATus:QUEStionable[:EVENt?]

Example: `"STAT:QUES?"`

Features: *RST value: –
SCPI: conforming

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:CONDition?

This command queries the CONDition section of the STATus:QUEStionable register.

Syntax: STATus:QUEStionable:CONDition?

Example: `"STAT:QUES:COND?"`

Features: *RST value: –
SCPI: conforming

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:ENABle

This command sets the bits of the ENABle section of the STATus-QUEStionable register.

Syntax: STATus:QUEStionable:ENABle 0 to 65535

Example: `"STAT:QUES:ENAB 65535"`

Features: *RST value: –
SCPI: conforming

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:PTRansition

This command sets the edge detectors of all bits of the STATus:OPERation register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:PTRansition 0 to 65535

Example: `"STAT:QUES:PTR 65535"`

Features: *RST value: –
SCPI: conforming

STATus:QUEStionable:NTRansition

This command sets the edge detectors of all bits of the STATus:OPERation register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:NTRansition 0 to 65535

Example: `"STAT:QUES:NTR 65535"`

Features: *RST value: –
SCPI: conforming

STATus:QUEStionable:POWer[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:POWer register.

Syntax: STATus:QUEStionable:POWer[:EVENt?]

Example: "STAT:QUES?"

Features: *RST value: –
SCPI: conforming

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:POWer:CONDition?

This command queries the content of the CONDition section of the STATus:QUEStionable:POWer register.

Syntax: STATus:QUEStionable:POWer:CONDition?

Example: "STAT:QUES:COND?"

Features: *RST value: –
SCPI: conforming

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:POWer:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable:POWer register.

Syntax: STATus:QUEStionable:POWer:ENABle 0 to 65535

Example: "STAT:QUES:ENAB 65535"

Features: *RST value: –
SCPI: conforming

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:POWer:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable:POWer register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:POWer:PTRansition 0 to 65535

Example: "STAT:QUES:PTR 65535"

Features: *RST-value: –
SCPI: conforming

STATus:QUEStionable:POWer:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable:POWer register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:POWer:NTRansition 0 to 65535

Example: `"STAT:QUES:NTR 65535"`

Features: *RST value: –
SCPI: conforming

STATus:QUEStionable:LIMit[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:LIMit register.

Syntax: STATus:QUEStionable:LIMit[:EVENt?]

Example: `"STAT:QUES?"`

Features: *RST value: –
SCPI: device-specific

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:LIMit:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:LIMit register.

Syntax: STATus:QUEStionable:LIMit:CONDition?

Example: `"STAT:QUES:COND?"`

Features: *RST value: –
SCPI: device-specific

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:LIMit:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable register.

Syntax: STATus:QUEStionable:LIMit:ENABle 0 to 65535

Example: `"STAT:QUES:ENAB 65535"`

Features: *RST value: –
SCPI: device-specific

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:LIMit:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable:LIMit register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:LIMit:PTRansition 0 to 65535

Example: `"STAT:QUES:PTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LIMit:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable:LIMit register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:LIMit:NTRansition 0 to 65535

Example: `"STAT:QUES:NTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:LMARgin register.

Syntax: STATus:QUEStionable:LMARgin[:EVENt?]

Example: `"STAT:QUES?"`

Features: *RST value: –
SCPI: device-specific

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:LMARgin:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:LMARgin register.

Syntax: STATus:QUEStionable:LMARgin:CONDition?

Example: `"STAT:QUES:COND?"`

Features: *RST value: –
SCPI: device-specific

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:LMARgin:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable:LMARgin register.

Syntax: STATus:QUEStionable:LMARgin:ENABle 0 to 65535

Example: `"STAT:QUES:ENAB 65535"`

Features: *RST value: –
SCPI: device-specific

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:LMARgin:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable: LMARgin register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:LMARgin:PTRansition 0 to 65535

Example: `"STAT:QUES:PTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable: LMARgin register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:LMARgin:NTRansition 0 to 65535

Example: `"STAT:QUES:NTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:SYNC[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:SYNC register.

Syntax: STATus:QUEStionable:SYNC[:EVENt?]

Example: `"STAT:QUES?"`

Features: *RST value: –
SCPI: device-specific

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:SYNC:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:SYNC register.

Syntax: STATus:QUEStionable:SYNC:CONDition?

Example: `"STAT:QUES:COND?"`

Features: *RST value: –
SCPI: device-specific

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:SYNC:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable: SYNC register.

Syntax: STATus:QUEStionable:SYNC:ENABle 0 to 65535

Example: `"STAT:QUES:ENAB 65535"`

Features: *RST value: –
SCPI: device-specific

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:SYNC:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable: SYNC register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:SYNC:PTRansition 0 to 65535

Example: `"STAT:QUES:PTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:SYNC:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable: SYNC register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:SYNC:NTRansition 0 to 65535

Example: `"STAT:QUES:NTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:ACPLimit register.

Syntax: STATus:QUEStionable:ACPLimit[:EVENt?]

Example: `"STAT:QUES:ACPL?"`

Features: *RST value: –
SCPI: device-specific

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:ACPLimit:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:ACPLimit register.

Syntax: STATus:QUEStionable:ACPLimit:CONDition?

Example: `"STAT:QUES:ACPL:COND?"`

Features: *RST value: –
SCPI: device-specific

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:ACPLimit:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable:ACPLimit register.

Syntax: STATus:QUEStionable:ACPLimit:ENABle 0 to 65535

Example: `"STAT:QUES:ACPL:ENAB 65535"`

Features: *RST value: –
SCPI: device-specific

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:ACPLimit:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable: ACPLimit register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:ACPLimit:PTRansition 0 to 65535

Example: `"STAT:QUES:ACPL:PTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable: ACPLimit register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:ACPLimit:NTRansition 0 to 65535

Example: `"STAT:QUES:ACPL:NTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:FREQuency[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionableFREQuency register.

Syntax: STATus:QUEStionable:FREQuency[:EVENt?]

Example: `"STAT:QUES:FREQ?"`

Features: *RST value: –
SCPI: device-specific

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:FREQuency:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:FREQuency register.

Syntax: STATus:QUEStionable:FREQuency:CONDition?

Example: `"STAT:QUES:FREQ:COND?"`

Features: *RST value: –
SCPI: device-specific

Readout does not delete the contents of the CONDition section.

STATus:QUEStionable:FREQuency:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable:FREQuency register.

Syntax: STATus:QUEStionable:FREQuency:ENABle 0 to 65535

Example: `"STAT:QUES:FREQ:ENAB 65535"`

Features: *RST value: –
SCPI: device-specific

The ENABle register selectively enables the individual events of the associated EVENt section for the sum bit in the status byte.

STATus:QUEStionable:FREQuency:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable:FREQuency register from 0 to 1 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:FREQuency:PTRansition 0 to 65535

Example: `"STAT:QUES:FREQ:PTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEStionable:FREQuency:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable:FREQuency register from 1 to 0 for the transitions of the CONDition bit.

Syntax: STATus:QUEStionable:FREQuency:NTRansition 0 to 65535

Example: `"STAT:QUES:FREQ:NTR 65535"`

Features: *RST value: –
SCPI: device-specific

STATus:QUEue[:NEXT?]

This command queries the earliest entry to the error queue, thus deleting it.

Syntax: STATus:QUEue[:NEXT?]

Example: `"STAT:QUE?"`

Features: *RST value: –
SCPI: conforming

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI (cf. Appendix B). If the error queue is empty, the error number 0, "no error", is returned. This command is identical with the command `SYSTem:ERRor`.

3.6.21 SYSTem Subsystem

This subsystem comprises a series of commands for general functions.

COMMAND	PARAMETERS	UNIT	COMMENT
SYSTem			
:COMMunicate			
:GPIB			
[:SELF]			
:ADDRess	0 to 30	--	
:RTERminator	LFEoi | EOI		
:RDEVice<1|2>			
:ADDRess	0 to 30	--	
:SERial<1|2>			
:CONTrol			
:DTR	IBFull | OFF		
:RTS	IBFull | OFF		
[:RECeive]		--	
:BAUD	<numeric_value>	--	
:BITS	7 | 8		
:PARity			
[:TYPE]	EVEN | ODD | NONE	--	
:SBITs	1 | 2		
:PACE	XON | NONE	--	
:DATE	<num>, <num>, <num>	--	
:DISPlay			
:UPDate	ON | OFF		
:ERRor?	--		query only
:PASSword		--	
[:CENable]	<string>		no query
:PRESet	--		no query
:SET	<block>	--	
:SPEaker		--	
:VOLume	<numeric_value>	--	
:TIME	0 to 23, 0 to 59, 0 to 59		
:VERSion?	--		query only

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess

This command changes the IEC/IEEE-bus address of the unit.

Syntax: SYSTem:COMMunicate:GPIB[:SELF]:ADDRess 0 to 30

Example: `"SYST:COMM:GPIB:ADDR 18"`

Features: *RST value: - (no influence on this parameter)
SCPI: conforming

SYSTem:COMMunicate:GPIB[:SELF]:RTERminator

This command changes the delimiter.

Syntax: SYSTem:COMMunicate:GPIB[:SELF]:RTERminator LFEOI | EOI

Example: `"SYST:COMM:GPIB:RTERM EOI"`

Features: *RST value: LFEOI
SCPI: device-specific

The analyzer contains a DMA-channel for communication via IEC-bus. This ensures maximum speed for the transfer of commands and data. The parser for command decoding integrated in the instrument is, however, only activated by the delimiter when the command is completely transferred. In order to make this possible for the transfer of binary data, too (e. g. trace data which are retransferred into the instrument), the delimiter recognition must be switched to the EOI signal prior to the transfer. Output of binary data from the instrument does not require such a switching.

SYSTem:COMMunicate:GPIB:RDEVice<1|2>:ADDRess

This command changes the IEC/IEEE-bus address of the unit which is selected as hardcopy device 1 or 2, provided that the IEC/IEEE-bus interface of this unit is set as an interface.

Syntax: SYSTem:COMMunicate:GPIB:RDEVice<1|2>:ADDRess 0 to 30

Example: `"SYST:COMM:GPIB:RDEV2:ADDR 5"`

Features: *RST value: 4
SCPI: conforming

SYSTem:COMMunicate:SERial<1|2>:CONTrol:DTR
SYSTem:COMMunicate:SERial<1|2>:CONTrol:RTS

These commands switch the hardware handshake procedure for the given serial interface off (OFF) or on (IBFull).

Syntax: SYSTem:COMMunicate:SERial<1|2>:CONTrol:DTR IBFull | OFF
SYSTem:COMMunicate:SERial<1|2>:CONTrol:RTS IBFull | OFF

Examples: `"SYST:COMM:SER:CONT:DTR OFF"`
`"SYST:COMM:SER2:CONT:RTS IBF"`

Features: *RST value: OFF
SCPI: conforming

The two commands have the same meaning. SERial1 and SERial 2 correspond to device COM1and COM2, respectively.

SYSTem:COMMunicate:SERial<1|2>[:RECeive]:BAUD

This command sets the transmission speed for the given serial interface.

Syntax: SYSTem:COMMunicate:SERial<1|2>[:RECeive:]BAUD <numeric_value>
<numeric_value>::= 75 | 150 | 300 | 600 | 1200 | 2400 | 9600

Example: `"SYST:COMM:SER:BAUD 2400"`

Features: *RST value: 9600
SCPI: conforming

SERial1 and SERial 2 correspond to device interface COM1 and COM2, respectively. Permissible values are 75 Baud, 150 Baud, 300 Baud, 600 Baud, 1200 Baud, 2400 Baud, 4800 Baud, 9600 Baud.

SYSTem:COMMunicate:SERial<1|2>[:RECeive]:BITS

This command defines the number of data bits per data word for the given serial interface.

Syntax: SYSTem:COMMunicate:SERial<1|2>[:RECeive]:BITS 7 | 8

Example: `"SYST:COMM:SER2:BITS 7"`

Features: *RST value: 8
SCPI: conforming

SERial1 and SERial 2 correspond to device interface COM1 and COM2, respectively.

SYSTem:COMMunicate:SERial<1|2>[:RECeive]:PARity[:TYPE]

This command defines the parity check for the given serial interface.

Syntax: SYSTem:COMMunicate:SERial<1|2>:RECeive:PARity[:TYPE]
EVEN | ODD | NONE

Example: `"SYST:COMM:SER:PAR EVEN"`

Features: *RST value: NONE
SCPI: conforming

SERial1 and SERial 2 correspond to device interface COM1 and COM2, respectively. Permissible values are:

EVEN	even parity
ODD	odd parity
NONE	no parity check.

SYSTem:COMMunicate:SERial<1|2>[:RECeive]:SBITs

This command defines the number of stopbits per data word for the given serial interface.

Syntax: SYSTem:COMMunicate:SERial<1|2>[:RECeive]:SBITs 1|2

Example: `"SYST:COMM:SER:SBITs 2"`

Features: *RST value: 1
SCPI: conforming

SERial1 and SERial 2 correspond to device interface COM1 and COM2, respectively.

SYSTem:COMMunicate:SERial<1|2>[:RECeive]:PACE

This command switches on or off the software handshake for the given serial interface.

Syntax: SYSTem:COMMunicate:SERial<1|2>[:RECeive]:PACE XON | NONE

Example: `"SYST:COMM:SER:PACE XON"`

features: *RST value: NONE
SCPI: conforming

SERial1 and SERial 2 correspond to device interface COM1 and COM2, respectively.

SYSTem:DATE

This command is used to enter the date for the internal calendar.

Syntax: SYSTem:DATE <num>,<num>,<num>
<num>,<num>,<num> ::= 1980 to 2099, 1 to 12, 1 to 31

Example: `" SYST:DATE 1994,12,1"`

Features: *RST value: –
SCPI: conforming

The sequence of entry is year, month, day.

SYSTem:DISPlay:UPDate

This command switches on or off the update of all display elements.

Syntax: SYSTem:DISPlay:UPDate ON | OFF

Example: `" SYST:DISP ON`

Features: *RST value: OFF
SCPI: device specific

SYSTem:ERRor?

This command queries the earliest entry to the error queue, thus deleting it.

Syntax: SYSTem:ERRor?

Example: `"SYST:ERR?"`

Features: *RST value: –
SCPI: conforming

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI (cf. Appendix B). If the error queue is empty, the error number 0, "no error", is returned. This command is identical with the command `STATus:QUEue:NEXT?`. This command is a query which is why it is not assigned an *RST value.

SYSTem:PASSword[:CENable]

This command enables access to the service functions by means of the password.

Syntax: SYSTem:PASSword[:CENable] <string>

Example: `"SYST:PASS 'XXXX'"`

Features: *RST value: –
SCPI: conforming

This command is an event which is why it is not assigned an *RST value and has no query.

SYSTem:SET

This command recalls the instrument setting saved by command SYST:SET?.

Syntax: SYSTem:SET

Example: `"SYST:SET"`

Features: *RST value: –
SCPI: conforming

The receive terminator has to be set to EOI to ensure reliable transfer of data (setting SYST:COMM:GPIB:RTER EOI).

SYSTem:PRESet

This command triggers an instrument reset.

Syntax: SYSTem:PRESet

Example: `"SYST:PRES"`

Features: *RST value: –
SCPI: conforming

The effect of this command corresponds to that of the *PRESET* key with manual control or to the *RST command.

SYSTem:SPEaker:VOLume

This command sets the volume of the built-in loudspeaker for demodulated signals.

Syntax: SYSTem:SPEaker:VOLume <numeric_value>
<numeric_value> ::= 0 to 1

Example: "SYST:SPE:VOL 0.5"

Features: *RST value: 0
SCPI: device-specific

The value 0 is the lowest volume, the value 1 is the highest volume.

SYSTem:TIME

This command sets the internal clock.

Syntax: SYSTem:TIME 0 to 23, 0 to 59, 0 to 59

Example: "SYST:TIME 12,30,30"

Features: *RST value: –
SCPI: conforming

The sequence of entry is hour, minute, second.

SYSTem:VERSion?

This command queries the number of the SCPI version, which is relevant for the instrument.

Syntax: SYSTem:VERSion?

Example: "SYST:VERS?"

Features: *RST value: –
SCPI: conforming

This command is a query which is why it is not assigned an *RST value.

3.6.22 TRACe Subsystem

The TRACe subsystem controls access to the instrument's internal trace memory.

COMMAND	PARAMETERS	UNIT	COMMENT
TRACe			
[:DATA]	TRACE1 | TRACE2 | TRACE3 | TRACE4, <block>|<numeric_value>...	-	
:COPY	TRACE1|TRACE2|TRACE3|TRACE4, TRACE1|TRACE2|TRACE3|TRACE4		

TRACe[:DATA]

This command transfers trace data from the controller to the instrument, the query reads trace data out of the instrument.

Syntax: TRACe[:DATA] TRACE1 | TRACE2 | TRACE3 | TRACE4, <block>|<numeric_value>
TRACe[:DATA]? TRACE1 | TRACE2 | TRACE3 | TRACE4'

Example:
```
"TRAC TRACE1,"+A$    (A$: data list in the current format)
"TRAC? TRACE1"
```

Features: *RST value: -
SCPI: conforming

The trace data are transferred in the current format (corresponding to the command FORMat ASCiilREAL). The device-internal trace memory is addressed using the trace names 'TRACE1' to 'TRACE4'.
The parameter of the query is the trace name TRACE1 to TRACE4, it indicates which trace memory will be read out.
The transfer of trace data from the controller to the instrument takes place by indicating the trace name and then the data to be transferred. In ASCII format, these data are values separated by commas. If the transfer takes place using the format real (REAL 32), the data are transferred in block format.

Saving and recalling trace data to/from the device-internal hard disk or to/from a floppy is controlled via the commands "`MMEMory:STORe:TRACe`" and "`MMEMory:LOAD:TRACe`" respectively.

TRACe:COPY

This command copies data from one trace to another. The second operand designates the source, the first operand the destination of the data to be copied.

Syntax: TRACe:COPY TRACE1| TRACE2| TRACE3| TRACE4 ,
TRACE1| TRACE2| TRACE3| TRACE4

Example:
```
"TRAC:COPY TRACE1,TRACE2"
```

Features: *RST value:
SCPI: conforming

This command is an event and therefore has no query and no *RST value assigned.

3.6.23 TRIGger Subsystem

The TRIGger subsystem is used to synchronize instrument actions with events. This makes it possible to control and synchronize the start of a sweep. An external trigger signal can be fed to the connector at the rear panel of the instrument. In split screen mode, a distinction is made between TRIGger1 (screen A) and TRIGger2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
TRIGger<1|2>			
[:SEQuence]			
:SOURce	IMMediate | LINE | EXTerna | IVIDeo | RFPower | TV | AF	--	TV only with option TV Demodulator
:LEVel			
[:EXTernal]	<numeric_value>	V|MV|UV	
:VIDeo	<numeric_value>	PCT	
:HOLDoff	<numeric_value>	S	
:SLOPe	POSitive|NEGative	--	Option TV Demodulator
:VIDeo	525 | 625		
:FORMat			Option TV Demodulator
:LPFRame			
:FIELd			Option TV Demodulator
:SELect	ALL | ODD | EVEN		
:LINE			Option TV Demodulator
:NUMBer	<numeric_value>		
:SSIGnal			
:POLarity	NEGative | POSitive		
:SYNChronize	<numeric_value>		Option FSE-K11or FSE-K10
:ADJust	ONCE		Option FSE-K11or FSE-K10 & FSE-B7
:FRAMe		s	
:AUTO	<numeric_value>		Option FSE-K11 or FSE-K10
	ONCE		Option FSE-K11 or FSE-K10 & FSE-B7
:SLOT		s	
:AUTO	FRAMe | TSC		Option FSE-K11or FSE-K10 & FSE-B7
:SOURCe			

TRIGger<1|2>[:SEQuence]:SOURce

This command selects the trigger source for the start of a sweep.

Syntax: TRIGger<1|2>[:SEQuence]:SOURce IMMediate | LINE | EXTernal | VIDeo | RFPower | TV | AF

Example: `"TRIG:SOUR EXT"`

Features: *RST value: IMMediate
SCPI: conforming

The value IMMediate corresponds to the "FREE RUN" setting.
Selecting the parameter TV is possible only when the option TV-demodulator is fitted, the parameter AF only in the vector signal analysis mode with analog demodulation.

TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal]

This command sets the level of the external trigger source.

Syntax: TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal] <numeric_value>
<numeric_value>::= –5.0 to +5.0V

Example: `"TRIG:LEV 2V"`

Features: *RST value: –5.0V
SCPI: conforming

TRIGger<1|2>[:SEQuence]:LEVel:VIDeo

This command sets the level of the video trigger source.

Syntax: TRIGger<1|2>[:SEQuence]:LEVel:VIDeo <numeric_value>
<numeric_value>::= 0 to 100PCT

Example: `"TRIG:LEV:VID 50PCT"`

Features: *RST value: 50 PCT
SCPI: device-specific

TRIGger<1|2>[:SEQuence]:HOLDoff

This command defines the length of the trigger delay.

Syntax: TRIGger<1|2>[:SEQuence]:HOLDoff <numeric_value>
<numeric_value>::= 0 to 100s

Example: `"TRIG:HOLD 500us"`

Features: *RST value: 0s
SCPI: conforming

TRIGger<1|2>[:SEQuence]:SLOPe

This command selects the slope of the trigger signal.

Syntax: TRIGger<1|2>[:SEQuence]:SLOPe POSitive | NEGative

Example: `"TRIG:SLOP NEG"`

Features: *RST value: POSitive
SCPI: conforming

The selected trigger slope applies to all trigger signal sources.

TRIGger<1|2>[:SEQuence]:VIDeo:FORMat:LPFRame

This command defines the number of lines per frame to be used (525 or 625 lines)

Syntax: TRIGger<1|2>[:SEQuence]:VIDeo:FORMat:LPFRame 525 | 625

Example: `"TRIG:VID:FORM:LPFR 525"`

Features: *RST value:
SCPI: conforming

This command is only valid if option FSE-B3, TV Demodulator, is fitted.

TRIGger<1|2>[:SEQuence]:VIDeo:LINE:NUMBer

This command selects the horizontal synchronizing signal for triggering.

Syntax: TRIGger<1|2>[:SEQuence]:VIDeo:LINE:NUMBer <numeric value>

Example: `"TRIG:VID:LINE:NUMB 17"`

Features: *RST value:
SCPI: conforming

The instrument is triggered at the specified line. This command is only valid if option FSE-B3, TV Demodulator is fitted.

TRIGger<1|2>[:SEQuence]:VIDeo:FIELd:SELect

This command selects the vertical synchronizing signal for triggering.

Syntax: TRIGger<1|2>[:SEQuence]:VIDeo:FIELd:SELect ALL | ODD | EVEN

Example: `"TRIG:VID:FIEL:SEL ALL"`

Features: *RST value:
SCPI: conforming

With the parameter ALL, the instrument is triggered when the field is changed, irrespective of the half fields. With ODD, triggering by the first half field, with even, triggering by the second half field is selected. This command is valid only if option FSE-B3, TV Demodulator, is fitted.

TRIGger<1|2>[:SEQuence]:VIDeo:SSIGnal:POLarity

This command defines the polarity of the video synchronizing signal.

Syntax: TRIGger<1|2>[:SEQuence]:VIDeo:SSIGnal:POLarity NEGative | POSitive

Example: `"TRIG:VID:SSIG:POL NEG "`

Features: *RST value:
SCPI: conforming

This command is valid only if option FSE-B3, TV Demodulator, is fitted.

TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe

This command defines the correction value for the time offset between the frame trigger and the midamble of the slot selected. The value set is corrected by means of the calculated offsets of the other slots and used as a base value for the correction of all slots.
This correction value is necessary in order to conserve the exact time relation between the trigger event and the midamble of the slot in question in cases where there is no midamble triggering.

Syntax: TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe <numeric_value>
<numeric_value>::= 0 to 100s

Example: `"TRIG:SYNC:ADJ:FRAM 30us"`

Features: *RST value: -- (depending on the slot selected)
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10.

TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe:AUTO

This command determines once the correction value for the time offset between the frame trigger and the midamble of the slot selected. The value set is corrected by means of the calculated offsets of the other slots and used as a base value for the correction of all slots.
This correction value is necessary in order to conserve the exact time relation between the trigger event and the midamble of the slot in question in cases where there is no midamble triggering.

Syntax: TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe:AUTO ONCE

Example: `"TRIG:SYNC:ADJ:FRAMe:AUTO ONCE"`

Features: *RST value: --
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and with option Vector Signal Analysis, FSE-B7.

TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT

This command defines the correction value for the time offset between the frame trigger and the midamble of the slot selected, without influencing the correction values of the other slots.
This correction value is necessary in order to conserve the exact time relation between the trigger event and the midamble of the slot in question in cases where there is no midamble triggering. The value set is corrected by means of the calculated offsets of the other slots and used as a base value for the correction of all slots.

Syntax: TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT <numeric_value>
<numeric_value>::= 0 to 100s

Example: `"TRIG:SYNC:ADJ:SLOT 30us"`

Features: *RST value: -- (depending on slot selected)
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11 or GSM MS Analyzer, FSE-K10.

TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT:AUTO

This command defines the correction value for the time offset between the frame trigger and the midamble of the slot selected. The value set is corrected by means of the calculated offsets of the other slots and used as a base value for the correction of all slots.
This correction value is necessary in order to conserve the exact time relation between the trigger event and the midamble of the slot in question in cases where there is no midamble triggering.

Syntax: TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT:AUTO ONCE

Example: `"TRIG:SYNC:ADJ:SLOT:AUTO ONCE"`

Features: *RST value: --
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10, and with option Vector Signal Analysis, FSE-B7.

TRIGger[:SEQuence]:SYNChronize:SOURce

This command defines the trigger reference point for measurements in the time domain (carrier power, power vs. time). The frame trigger of the base station or mobile may be selected as well as the relation to the midamble (TSC) of the slot to be measured.

Syntax: TRIGger[:SEQuence]:SYNChronize:SOURce FRAME | TSC

Example: `"TRIG:SYNC:SOURce TSC"`

Features: *RST value: FRAME
SCPI: device-specific

This command is available only in conjunction with option GSM BTS Analyzer, FSE-K11, or GSM MS Analyzer, FSE-K10. The parameter TSC requires in addition the option Vector Signal Analysis, FSE-B7.

3.6.24 UNIT Subsystem

The UNIT subsystem is used to switch the basic unit of setting parameters. In split screen mode, a distinction is made between UNIT1 (screen A) and UNIT2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
UNIT<1|2>			
:POWer	DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere V | W | DB | PCT | UNITLESS | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ		
:PROBe	<Boolean>		

UNIT<1|2>:POWer

This command selects the default unit for input and output.

Syntax: UNIT<1|2>:POWer DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | V | W | DB | PCT | UNITLESS | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ

Example: `"UNIT:POW DBUV"`

Features: *RST value: DBM
SCPI: conforming

UNIT<1|2>:PROBe

This command determines whether the coding of a probe which is connected to the front panel is taken into consideration (ON) or not (OFF).

Syntax: UNIT<1|2>:PROBe ON | OFF

Example: `"UNIT:PROB OFF"`

Features: *RST value: ON
SCPI: device-specific

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3.9 Table of Softkeys with IEC/IEEE-Bus Command Assignment

3.9.1 Basic Instrument - Signal Analysis Mode

3.9.1.1 FREQUENCY Key Group

START	
START MANUAL	[SENSe:]FREQuency:STARt <numeric_value>
STOP FIXED	[SENSe:]FREQuency:STARt:LINK STOP
SPAN FIXED	[SENSe:]FREQuency:STARt:LINK SPAN
CENTER FIXED	[SENSe:]FREQuency:STARt:LINK CENTer
STOP	
STOP MANUAL	[SENSe:]FREQuency:STOP <numeric_value>
START FIXED	[SENSe:]FREQuency:STOP:LINK STARt
SPAN FIXED	[SENSe:]FREQuency:STOP:LINK SPAN
CENTER FIXED	[SENSe:]FREQuency:STOP:LINK CENTer
CENTER	
CENTER MANUAL	[SENSe:]FREQuency:CENTer <numeric_value>
SPAN FIXED	[SENSe:]FREQuency:CENTer:LINK SPAN
START FIXED	[SENSe:]FREQuency:CENTer:LINK STARt
STOP FIXED	[SENSe:]FREQuency:CENTer:LINK STOP
FREQUENCY OFFSET	[SENSe:]FREQuency:OFFSet <numeric_value>

STEP	
STEPSIZE MANUAL	`[SENSe:]FREQuency:CENTer:STEP <numeric_value>`
AUTO 0.1 * RBW	`[SENSe:]FREQuency:CENTer:STEP:LINK RBW;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 10PCT`
AUTO 0.5 * RBW	`[SENSe:]FREQuency:CENTer:STEP:LINK RBW;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 50PCT`
AUTO X * RBW	`[SENSe:]FREQuency:CENTer:STEP:LINK RBW;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <numeric_value>`
AUTO 0.1 * SPAN	`[SENSe:]FREQuency:CENTer:STEP:LINK SPAN;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 10PCT`
AUTO 0.5 * SPAN	`[SENSe:]FREQuency:CENTer:STEP:LINK SPAN;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 50PCT`
AUTO X * SPAN	`[SENSe:]FREQuency:CENTer:STEP:LINK SPAN;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <numeric_value>`
STEPSIZE = CENTER	no corresponding IEC/IEEE-bus command
SPAN	
SPAN MANUAL	`[SENSe:]FREQuency:SPAN <numeric_value>`
ZERO SPAN	`[SENSe:]FREQuency:SPAN 0HZ`
FULL SPAN	`[SENSe:]FREQuency:SPAN:FULL`
LAST SPAN	no corresponding IEC/IEEE-bus command
CENTER FIXED	`[SENSe:]FREQuency:SPAN:LINK CENTer`
START FIXED	`[SENSe:]FREQuency:SPAN:LINK START`
STOP FIXED	`[SENSe:]FREQuency:SPAN:LINK STOP`
ZOOM	`DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM ON|OFF`
MOVE ZOOM START	`DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM[:FREQuency]:STARt <numeric_value>`
MOVE ZOOM STOP	`DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM[:FREQuency]:STOP <numeric_value>`
MOVE ZOOM WINDOW	`DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM[:FREQuency]:CENTer <numeric_value>`
ZOOM OFF	`DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM OFF`

3.9.1.2 LEVEL Key Group

REF	
MAX LEVEL AUTO	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RVALue:AUTO ON
MAX LEVEL MANUAL	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RVALue:AUTO OFF; DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RVALue <numeric_value>
REF LEVEL	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RLEVel <numeric_value>
REF LEVEL OFFSET	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RLEVel:OFFSet <num_value>
GRID ABS/REL	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:MODE ABSolute|RELative
UNIT	--
dBm	CALCulate<1|2>:UNIT:POWer DBM
dBµV	CALCulate<1|2>:UNIT:POWer DBUV
dBµA	CALCulate<1|2>:UNIT:POWer DBUA
dBpW	CALCulate<1|2>:UNIT:POWer DBPW
VOLT	CALCulate<1|2>:UNIT:POWer VOLT
AMPERE	CALCulate<1|2>:UNIT:POWer AMPere
WATT	CALCulate<1|2>:UNIT:POWer WATT
dBmV	CALCulate<1|2>:UNIT:POWer DBMV
dB*/MHz	CALCulate<1|2>:UNIT:POWer DBUV_MHZ CALCulate<1|2>:UNIT:POWer DBUA_MHZ CALCulate<1|2>:UNIT:POWer DBMV_MHZ
PROBE CODE ON / OFF	UNIT:PROBe ON|OFF

RANGE	
LINEAR/%	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y:SPACing PERCent
LINEAR/dB	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y:SPACing LINear
LOG MANUAL	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y:SPACing LOGarithmic; DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe] <numeric_value>

3.9.1.3 INPUT Key

INPUT	
RF ATTEN MANUAL	INPut:ATTenuation <numeric_value>
ATTEN AUTO NORMAL	INPut:ATTenuation:AUTO:MODE NORMal; INPut:ATTenuation:AUTO ON
ATTEN AUTO LOW NOISE	INPut:ATTenuation:AUTO:MODE LNOise; INPut:ATTenuation:AUTO ON
ATTEN AUTO LOW DIST	INPut:ATTenuation:AUTO:MODE LDIStortion; INPut:ATTenuation:AUTO ON
MIXER LEVEL	INPut:MIXer <numeric value>
INPUT SELECT	--
RF INPUT 50 OHM	INPut:IMPedance 50
RF INPUT 75 OHM/RAM	INPut:IMPedance:CORRection RAM
RF INPUT 75OHM/RAZ	INPut:IMPedance:CORRection RAZ

3.9.1.4 MARKER Key Group

NORMAL	
MARKER 1..4	CALCulate<1|2>:MARKer<1...4>[:STATe] ON | OFF; CALCulate<1|2>:MARKer<1...4>:X <numeric value>; CALCulate<1|2>:MARKer<1...4>:Y?
ALL MARKER OFF	CALCulate<1|2>:MARKer<1...4>:AOFF

SIGNAL TRACK	CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack[:STATe] ON | OFF
MARKER INFO	DISPlay:WINDow<1|2>:MINFo ON | OFF (display) queries: CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? ACPower| CPOWer| OBANdwidth| OBWidth| CN| CN0 CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN:RESult?
MARKER ZOOM	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ZOOM <numeric_value>
MARKER DEMOD	--
AM	CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation:SELect AM
FM	CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation:SELect FM
MKR DEMOD ON/OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation[:STATe] ON | OFF
MKR STOP TIME	CALCulate<1|2>:MARKer<1..4>:FUNCtion:DEModulation:HOLDoff <num_value>
VOLUME	SYSTem:SPEaker:VOLume <numeric_value>
SIGNAL COUNT	CALCulate<1|2>:MARKer<1...4>:COUNt ON | OFF; CALCulate<1|2>:MARKer<1...4>:COUNt:FREQuency?
COUNTER RESOL	CALCulate<1|2>:MARKer<1...4>:COUNt:RESolution <numeric value>
NOISE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe[:STATe] ON | OFF; CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe:RESult?
POWER MEAS SETTINGS	--
SET NO OF ADJ CHAN'S	[SENSe:]POWer:ACHannel:ACPairs
ACP STANDARD	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:PRESet NADC | TETRA | PDC | PHS| CDPD | CDMA | NONE
CH FILTER ON/OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:CFILter ON | OFF
CHANNEL BANDWIDTH	[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel] <numeric_value> [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <numeric_value> [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<1|2> <numeric_value>
CHANNEL SPACING	[SENSe:]POWer:ACHannel:SPACing[:UPPer] <numeric_value>

EDIT ACP LIMITS	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel <num_value>,<num_value> CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2> <numeric_value>, <numeric_value> CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:STATe ON | OFF
LIMIT CHECK	CALCulate:LIMit:ACPower[:STATe] ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:RESult? CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:RESult?
% POWER BANDWIDTH	[SENSe:]POWer: BANDwidth|BWIDth <numeric_value>
CHANNEL POWER	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect CPOWer; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? CPOWer; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
CP/ACP ABS/REL	[SENSe:]POWer:ACHannel:MODE ABSolute|RELative
SET CP REFERENCE	[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE
C/N	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect CN; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? CN; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
C/No	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect CN0; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? CN0; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
ADJACENT CHAN POWER	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect ACPower; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? ACPower; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
OCCUPIED PWR BANDW	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect OBANdwidth | OBWidth CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? OBANdwidth| OBWidth CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
ADJUST CP SETTINGS	[SENSe:]POWer:ACHannel:PRESet ACPower|CPOWer|OBANdwidth|OBWidth|CN|CN0
STEP	
STEPSIZE AUTO	CALCulate<1|2>:MARKer<1...4>:STEP:AUTO ON | OFF
STEPSIZE MANUAL	CALCulate<1|2>:MARKer<1...4>:STEP[:INCRement] <numeric_value>
MKR TO STEPSIZE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:MSTep
DELTA	
DELTA 1...4	CALCulate<1|2>:DELTamarker<1...4>[:STATe] ON | OFF CALCulate<1|2>:DELTamarker<1...4>:X <numeric value> CALCulate<1|2>:DELTamarker<1...4>:X:RELative? CALCulate<1|2>:DELTamarker<1...4>:Y?

ALL DELTA OFF	CALCulate<1|2>:DELTamarker<1...4>:AOFF
DELTA MKR ABS REL	CALCulate<1|2>:DELTamarker<1...4>:MODE ABSolute | RELative
REFERENCE FIXED	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed[:STATe] ON | OFF
REFERENCE POINT	--
REF POINT FREQUENCY	CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:X <num_value>
REF POINT LEVEL	CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:Y <num_value>
REF POINT LVL OFFSET	CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:Y:OFFSet <num_value>
REF POINT TIME	CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:X <num_value>
PHASE NOISE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise[:STATe] ON | OFF
STEP	
STEPSIZE AUTO	CALCulate<1|2>:DELTamarker<1...4>:STEP:AUTO ON | OFF
MANUAL STEPSIZE	CALCulate<1|2>:DELTamarker<1...4>:STEP[:INCRement] <numeric_value>

SEARCH	
NEXT PEAK	CALCulate<1|2>:MARKer<1...4>:MAXimum:NEXT CALCulate<1|2>:DELTamarker<1...4>:MAXimum:NEXT
NEXT PEAK LEFT	CALCulate<1|2>:MARKer<1...4>:MAXimum:LEFT CALCulate<1|2>:DELTamarker<1...4>:MAXimum:LEFT
NEXT PEAK RIGHT	CALCulate<1|2>:MARKer<1...4>:MAXimum:RIGHt CALCulate<1|2>:DELTamarker<1...4>:MAXimum:RIGHt
SELECT MARKER	no corresponding IEC/IEEE-bus command
ACTIVE MKR/DELTA	no corresponding IEC/IEEE-bus command

PEAK	CALCulate<1|2>:MARKer<1...4>:MAXimum[:PEAK] CALCulate<1|2>:DELTamarker<1...4>:MAXimum[:PEAK]
MIN	CALCulate<1|2>:MARKer<1...4>:MINimum[:PEAK] CALCulate<1|2>:DELTamarker<1...4>:MINimum[:PEAK]
NEXT MIN	CALCulate<1|2>:MARKer<1...4>:MINimum:NEXT CALCulate<1|2>:DELTamarker<1...4>:MINimum:NEXT
NEXT MIN LEFT	CALCulate<1|2>:MARKer<1...4>:MINimum:LEFT CALCulate<1|2>:DELTamarker<1...4>:MINimum:LEFT
NEXT MIN RIGHT	CALCulate<1|2>:MARKer<1...4>:MINimum:RIGHt CALCulate<1|2>:DELTamarker<1...4>:MINimum:RIGHt
EXLUDE LO ON OFF	CALCulate<1|2>:MARKer<1...4>:LOEXlude ON | OFF
PEAK EXCURSION	CALCulate<1|2>:MARKer<1...4>:PEXCursion <numeric_value>
N dB DOWN	CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown <numeric_value>
SEARCH LIM ON/OFF	CALCulate<1|2>:MARKer<1...4>:X:SLIMits[STATe] ON | OFF
SHAPE FACT 3/60	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor (60dB/3dB) CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor:STATe ON | OFF
SHAPE FACT 6/60	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor (60dB/6dB) CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor:STATe ON | OFF
SUM MKR ON/OFF	CALCulate<1|2>:MARKer<1..4>:FUNCtion:SUMMary:MAXimum[:STATe] ON | OFF CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak[:STATe] ON | OFF CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak[:STATe] ON | OFF CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle[:STATe] ON | OFF
SUMMARY MARKER	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MAXimum:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN:RESult?
AVERAGE ON/OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AVERage ON | OFF
MEAN	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN[:STATe] ON | OFF
PEAK HOLD ON/OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PHOLd ON | OFF
RMS	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS[:STATe] ON | OFF
ALL SUM MKR OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AOFF

CALCulate<1|2>:MARKer<1...4>:FUNCtion:CENTer

CALCulate<1|2>:MARKer<1...4>:FUNCtion:CSTep

CALCulate<1|2>:MARKer<1...4>:FUNCtion:REFerence

CALCulate<1|2>:MARKer<1...4>:FUNCtion:STARt

CALCulate<1|2>:MARKer<1...4>:FUNCtion:STOP

CALCulate<1|2>:MARKer<1...4>:TRACe <numeric value>
CALCulate<1|2>:DELTamarker<1...4>:TRACe <numeric value>

3.9.1.5 LINES Key Group

D LINES

DISPLAY LINE 1/2
```
CALCulate:DLINe<1|2>:STATe  ON | OFF;
CALCulate:DLINe<1|2> <numeric_value>
```

FREQUENCY LINE 1/2
```
CALCulate:FLINe<1|2>:STATe ON | OFF;
CALCulate:FLINe<1|2> <numeric_value>
```

REFERENCE LINE
```
CALCulate:RLINe:STATe ON | OFF;
CALCulate:RLINe <numeric_value>
```

THRESHOLD LINE
```
CALCulate:THReshold ON | OFF;
CALCulate:THReshold <numeric_value>
```

TIME LINE 1/2
```
CALCulate:TLINe<1|2>:STATe ON | OFF;
CALCulate:TLINe<1|2> <numeric_value>
```

LIMITS

SELECT LIMIT LINE
```
CALCulate<1|2>:LIMit<1...8>:NAME <string>;
CALCulate<1|2>:LIMit<1...8>:STATe ON | OFF
```

COPY LIMIT LINE
```
CALCulate<1|2>:LIMit<1...8>:COPY 1...8 | <name>
```

DELETE LIMIT LINE
```
CALCulate<1|2>:LIMit<1...8>:DELete
```

X OFFSET
```
CALCulate<1|2>:LIMit<1...8>:CONTrol:OFFset <numeric_value>
```

Y OFFSET
```
CALCulate<1|2>:LIMit<1...8>:UPPer:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:OFFset <numeric_value>
```

EDIT LIMIT LINE
```
CALCulate<1|2>:LIMit<1...8>:UNIT DBM| DBPW| WATT| DBUV| VOLT|DBUA|
       AMPere| DB| DBUV_MHZ| DBUA_MHZ| DEG| RAD| S| HZ| PCT | UNITLESS
CALCulate<1|2>:LIMit<1...8>:CONTrol[:DATA] <num_value>, <num_value>..
CALCulate<1|2>:LIMit<1...8>:CONTrol:DOMain   FREQuency|TIME
CALCulate<1|2>:LIMit<1...8>:CONTrol:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:CONTrol:MODE   RELative | ABSolute
CALCulate<1|2>:LIMit<1...8>:CONTrol:UNIT[:TIME] S | SYM
CALCulate<1|2>:LIMit<1...8>:UPPer[:DATA] <num_value>, <num_value>..
CALCulate<1|2>:LIMit<1...8>:UPPer:STATe   ON | OFF
CALCulate<1|2>:LIMit<1...8>:UPPer:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:UPPer:MARGin <numeric_value>
CALCulate<1|2>:LIMit<1...8>:UPPer:MODE   RELative | ABSolute
CALCulate<1|2>:LIMit<1...8>:LOWer[:DATA] <num_value>,<num_value>..
CALCulate<1|2>:LIMit<1...8>:LOWer:STATe ON | OFF
CALCulate<1|2>:LIMit<1...8>:LOWer:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:MARGin <numeric_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:MODE   RELative | ABSolute
```

NEW LIMIT LINE	see EDIT LIMIT LINE
NAME	CALCulate<1|2>:LIMit<1...8>:NAME <string>
DELETE VALUE	no corresponding IEC/IEEE-bus command
INSERT VALUE	no corresponding IEC/IEEE-bus command
VALUES	no corresponding IEC/IEEE-bus command
SAVE LIMIT LINE	automatically executed during IEC/IEEE-bus operation
SHIFT X LIMIT LINE	CALCulate<1|2>:LIMit<1...8>:CONTrol:SHIFt <numeric_value>
SHIFT Y LIMIT LINE	CALCulate<1|2>:LIMit<1...8>:UPPer:SHIFt <numeric_value> CALCulate<1|2>:LIMit<1...8>:LOWer:SHIFt <numeric_value>

3.9.1.6 TRACE Key Group

TRACE 1	
CLEAR/WRITE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE WRITe
VIEW	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE VIEW
AVERAGE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE AVERage
BLANK	DISPlay[:WINDow<1|2>]:TRACe<1...4>[:STATe] OFF
MAX HOLD	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE MAXHold
MIN HOLD	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE MINHold
HOLD CONT ON/OFF	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE:HCONtinuous ON|OFF
SWEEP COUNT	[SENSe:]SWEep:COUNt <numeric_value>
ANALOG TR ON/OFF	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE:ANALog ON|OFF
COPY..	TRACe:COPY TRACE1| TRACE2| TRACE3| TRACE4 , TRACE1| TRACE2| TRACE3| TRACE4

DETECTOR	--
AUTO SELECT	[SENSe:]DETector[:FUNCtion]:AUTO ON | OFF
DETECTOR AUTOPEAK	[SENSe:]DETector[:FUNCtion] APEak
DETECTOR MAX PEAK	[SENSe:]DETector[:FUNCtion] POSitive
DETECTOR MIN PEAK	[SENSe:]DETector[:FUNCtion] NEGative
DETECTOR SAMPLE	[SENSe:]DETector[:FUNCtion] SAMPle
DETECTOR RMS	[SENSe:]DETector[:FUNCtion] RMS
DETECTOR AVERAGE	[SENSe:]DETector[:FUNCtion] AVERage
TRACE MATH	--
T1-REF ->T1	CALCulate<1|2>:MATH<1...4>[:EXPRession][:DEFine] <expr>
T1-T2/T3/T4 +REF->T1	CALCulate<1|2>:MATH<1...4>[:EXPRession][:DEFine] <expr>
TRACE MATH OFF	CALCulate<1|2>:MATH<1...4>:STATe ON | OFF
ADJUST TO TRACE	no corresponding IEC/IEEE-bus command

3.9.1.7 SWEEP Key Group

COUPLING	
RES BW AUTO	[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO ON | OFF
RES BW MANUAL	[SENSe:]BANDwidth|BWIDth[:RESolution] <numeric_value>
VIDEO BW AUTO	[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO ON | OFF
VIDEO BW MANUAL	[SENSe:]BANDwidth|BWIDth:VIDeo <numeric_value>
COUPLING DEFAULT	[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO ON; [SENSe:]BANDwidth|BWIDth:VIDeo:AUTO ON; [SENSe:]SWEep:TIME:AUTO ON
RBW 1kHz ANA/DIG	[SENSe:]BANDwidth|BWIDth[:RESolution]:MODE ANALog | DIGital
RBW <=1kHz FFT/NORM	[SENSe:]BANDwidth|BWIDth[:RESolution]:MODE:FFT ON | OFF
SWEEP TIME AUTO	[SENSe:]SWEep:TIME:AUTO ON | OFF
SWEEP TIME MANUAL	[SENSe:]SWEep:TIME <numeric_value>
MAIN PLL BANDWIDTH	[SENSe:]BANDwidth|BWIDth:PLL AUTO | HIGH | MEDium | LOW
COUPLING RATIO	--
RBW / VBW SINE [1]	[SENSe:]BANDwidth|BWIDth:VIDeo SINe
RBW / VBW MANUAL	[SENSe:]BANDwidth|BWIDth:VIDeo <numeric_value>
RBW / VBW NOISE [10]	[SENSe:]BANDwidth|BWIDth:VIDeo NOISe
RBW / VBW PULSE [.1]	[SENSe:]BANDwidth|BWIDth:VIDeo PULSe
SPAN / RBW AUTO [50]	[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio 0.02
SPAN / RBW MANUAL	[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <numeric_value>

TRIGGER	
FREE RUN	TRIGger[:SEQuence]:SOURce IMMediate
LINE	TRIGger[:SEQuence]:SOURce LINE
VIDEO	TRIGger[:SEQuence]:SOURce VIDeo TRIGger[:SEQuence]:LEVel:VIDeo <numeric value>
EXTERN	TRIGger[:SEQuence]:SOURce EXTernal TRIGger[:SEQuence]:LEVel[:EXTernal] <numeric_value>
RF POWER	TRIGger[:SEQuence]:SOURce RFPower
SLOPE POS/NEG	TRIGger[:SEQuence]:SLOPe POSitive|NEGative
TRIGGER DELAY	TRIGger[:SEQuence]:HOLDoff <numeric_value>
SWEEP	
CONTINUOUS SWEEP	INITiate:CONTinuous ON
SINGLE SWEEP	INITiate:CONTinuous OFF
SWEEP COUNT	[SENSe:]SWEep:COUNt <numeric_value>
SGL SWEEP DISP OFF	INITiate:DISPlay ON | OFF
GATE ON/OFF	[SENSe:]SWEep:EGATe ON | OFF
GATE SETTINGS	--
GATE LEVEL	[SENSe:]SWEep:EGATe:LEVel <numeric_value>
GATE MODE LEVEL/EDGE	[SENSe:]SWEep:EGATe:TYPE LEVel | EDGE
GATE POL POS/NEG	[SENSe:]SWEep:EGATe:POLarity POSitive | NEGative

GATE DELAY	[SENSe:]SWEep:EGATe:HOLDoff <numeric_value>
GATE LENGTH	[SENSe:]SWEep:EGATe:LENGth <numeric_value>
GATE EXTERN	[SENSe:]SWEep:EGATe:SOURce EXTernal
GATE RF POWER	[SENSe:]SWEep:EGATe:SOURce RFPower
GAP SWEEP ON/OFF	[SENSe:]SWEep:GAP ON | OFF
GAP SWEEP SETTINGS	--
TRIGGER LEVEL	TRIGger[:SEQuence]:LEVel:VIDeo <numeric value>
PRE TRIGGER	[SENSe:]SWEep:GAP:PRETrigger <numeric_value>
GAP LENGTH	[SENSe:]SWEep:GAP:LENGth <numeric_value>
TRG TO GAP TIME	[SENSe:]SWEep:GAP:TRGTogap <numeric_value>

3.9.2 Basic Instrument - General Device Settings

3.9.2.1 DATA VARIATION Key Group

HOLD	
LOCK ALL	no corresponding IEC/IEEE-bus command
LOCK DATA	no corresponding IEC/IEEE-bus command
UNLOCK	no corresponding IEC/IEEE-bus command
STEP	if needed, the step width is entered in the subsystem of the corresponding parameter.
STEPSIZE AUTO	--
STEPSIZE MANUAL	--

3.9.2.2 SYSTEM Key Group

DISPLAY	
ACTIVE SCREEN A	The screen is selected via the numeric suffix of the individual commands.
FULL SCREEN	`DISPlay:FORmat SINGle`
SPLIT SCREEN	`DISPlay:FORmat SPLit`
SCREEN COUPLING	--
COUPLING CONTROL	`INSTrument:COUPle CONTrol`
HORIZONTAL SCALING	`INSTrument:COUPle X`
MODE COUPLED	`INSTrument:COUPle MODE`
SCREENS UNCOUPLED	`INSTrument:COUPle NONE | ALL`
VERTICAL SCALING	`INSTrument:COUPle Y`

CONFIG DISPLAY	--
SELECT OBJECT	--
BRIGHTNESS	DISPlay:CMAP:HSL <hue>,<sat>,<lum>
DATA ENTRY	--
DATAENTRY X	no corresponding IEC/IEEE-bus command
DATAENTRY Y	no corresponding IEC/IEEE-bus command
DEFAULT POSITION	no corresponding IEC/IEEE-bus command
DATAENTRY OPAQUE	no corresponding IEC/IEEE-bus command
PREDEFINED COLORS	DISPlay:CMAP<1...13>:PDEFined BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta
DEFAULT COLORS	DISPlay:CMAP<1...13>:DEFault
FREQUENCY ON/OFF	DISPlay:ANNotation:FREQuency ON|OFF
LOGO ON/OFF	DISPlay:LOGO ON|OFF
SATURATION	DISPlay:CMAP<1...13>:HSL <hue>,<sat>,<lum>
TINT	DISPlay:CMAP<1...13>:HSL <hue>,<sat>,<lum>
TIME ON OFF	DISPlay[:WINDow<1|2>]:TIME ON | OFF
DISPLAY COMMENT	DISPlay[:WINDow<1|2>]:TEXT[:DATA] <string> DISPlay[:WINDow<1|2>]:TEXT:STATe ON | OFF
CAL	
CAL CORR ON/OFF	CALibration:STATe ON | OFF
CAL LO SUPP	CALibration:LOSuppression?
CAL LOG	CALibration:LDETector?

CAL RES BW	CALibration:BANDwidth|BWIDth[:RESolution]?
CAL SHORT	CALibration:SHORt?
CAL TOTAL	CALibration[:ALL]?
CAL RESULTS	no corresponding IEC/IEEE-bus command
CAL I/Q	CALibration:IQ?
PRESEL PEAK	CALibration:PPEak?
INFO	
FIRMWARE VERSION	*IDN?
HARDWARE+ OPTIONS	*OPT?
SELFTEST	*TST?
EXECUTE TESTS	*TST?
SYSTEM MESSAGES	SYSTem:ERRor?
CLEAR ALL MESSAGES	--
CLEAR MESSAGE	SYSTem:ERRor?
UPDATE MESSAGES	--

3.9.2.3 CONFIGURATION Key Group

MODE	The submenus are described under the associated operating mode.
ANALYZER	`INSTrument[:SELect] SANalyzer`
VECTOR ANALYZER	`INSTrument[:SELect] SANalyzer | DDEMod`
TRACKING GENERATOR	`OUTPut:[:STATe] ON | OFF`
TV DEMOD	`[SENSe:]TV[:STATe] ON | OFF`
SETUP	
TRANSDUCER	--
TRANSDUCER FACTOR	`[SENSe:]CORRection:TRANsducer:SELect <name>` `[SENSe:]CORRection:TRANsducer[:STATe] ON | OFF`
TRANSDUCER SET	`[SENSe:]CORRection:TSET:SELect <name>` `[SENSe:]CORRection:TSET[:STATe] ON | OFF`
EDIT TRD FACTOR	`[SENSe:]CORRection:TRANsducer:SCALing LINear|LOGarithmic`
TRD FACTOR NAME	`[SENSe:]CORRection:TRANsducer:SELect <name>`
TRD FACTOR UNIT	`[SENSe:]CORRection:TRANsducer:UNIT <string>`
TRD FACTOR VALUES	`[SENSe:]CORRection:TRANsducer:DATA <freq>,<level>..`
INSERT LINE	no corresponding IEC/IEEE-bus command
DELETE LINE	no corresponding IEC/IEEE-bus command
SAVE TRD FACTOR	automatically executed during IEC/IEEE-bus operation
EDIT TRD SET	--
TRANSD SET NAME	`[SENSe:]CORRection:TSET:SELect <name>`
TRANSD SET UNIT	`[SENSe:]CORRection:TSET:UNIT <string>`

TRANSD SET RANGES	[SENSe:]CORRection:TSET:RANGe<1...10> <freq>,<freql>,<name>..
INSERT LINE	no corresponding IEC/IEEE-bus command
DELETE LINE	no corresponding IEC/IEEE-bus command
SAVE TRD SET	automatically executed during IEC/IEEE-bus operation
NEW FACT/SET	see *EDIT TRD FACTOR* or *EDIT TRD SET*
DELETE FACTOR/SET	[SENSe:]CORRection:TRANsducer:DELete [SENSe:]CORRection:TSET:DELete
OPTIONS	no corresponding IEC/IEEE-bus command
EXTERNAL REFERENCE	[SENSe:]ROSCillator:EXTernal:FREQuency <numeric_value>
REFERENCE INT/EXT	[SENSe:]ROSCillator:SOURce INTernal|EXTernal
GENERAL SETUP	--
GPIB ADDRESS	SYSTem:COMMunicate:GPIB[:SELF]:ADDRess 0...30
KEY CLICK ON/OFF	no corresponding IEC/IEEE-bus command
USER PORT A/B	INPut:UPORt<1|2>[:VALue]? INPut:UPORt<1|2>:STATe ON | OFF OUTPut:[:STATe] ON | OFF OUTPut:UPORt<1|2>[:VALue] <Binary>
COM PORT 1/2	SYSTem:COMMunicate:SERial<1|2>:CONTrol:DTR IBFull | OFF SYSTem:COMMunicate:SERial<1|2>:CONTrol:RTS IBFull | OFF SYSTem:COMMunicate:SERial<1|2>[:RECeive:]BAUD <numeric_value> SYSTem:COMMunicate:SERial<1|2>[:RECeive]:BITS 7 | 8 SYSTem:COMMunicate:SERial<1|2>:RECeive:PARity[:TYPE] EVEN | ODD | NONE SYSTem:COMMunicate:SERial<1|2>[:RECeive]:SBITs 1|2 SYSTem:COMMunicate:SERial<1|2>[:RECeive]:PACE XON | NONE
DATE	SYSTem:DATE <num>,<num>,<num>
EXTERNAL KEYBOARD	no corresponding IEC/IEEE-bus command
TIME	SYSTem:TIME 0...23, 0...59, 0...59
MOUSE	no corresponding IEC/IEEE-bus command

SERVICE	--
ENTER PASSWORD	SYSTem:PASSword[:CENable] <string>
INPUT CAL	DIAGnostic:SERVice:INPut[:SELect] CALibration
INPUT RF	DIAGnostic:SERVice:INPut[:SELect] RF
NOISE SOURCE	DIAGnostic:SERVice:NSOurce ON | OFF
REFERENCE ADJUST	--
REFERENCE	[SENSe:]ROSCillator:[INTernal:]TUNe <numeric_value>
REFERENCE PROG	[SENSe:]ROSCillator:[INTernal:]TUNe:SAVe
SERVICE FUNCTION	DIAGnostic:SERVice:FUNCtion <numeric_value>,<numeric_value>...
HARMONIC GENERATOR	DIAGnostic:SERVice:HGENerator OFF | 10KHZ | 100KHZ | BALanced

3.9.2.4 STATUS Key Group

LOCAL	Device message "Go to LOCAL (GTL)"

3.9.2.5 HARDCOPY Key Group

START
HCOPy[:IMMediate<1|2>]

SETTINGS

COPY SCREEN
HCOPy:ITEM:ALL

COPY TABLE
HCOPy:ITEM:WINDow<1|2>:TABle:STATe ON | OFF

COPY TRACE
HCOPy:ITEM:WINDow<1|2>:TRACe:STATe ON | OFF

TRC COLOR AUTO INC
HCOPy:ITEM:WINDow<1|2>:TRACe:CAINcrement ON | OFF

SELECT QUADRANT
--

FULL PAGE
HCOPy:PAGE:DIMensions:FULL

LOWER LEFT
HCOPy:PAGE:DIMensions:QUADrant 2

LOWER RIGHT
HCOPy:PAGE:DIMensions:QUADrant 4

UPPER LEFT
HCOPy:PAGE:DIMensions:QUADrant 1

UPPER RIGHT
HCOPy:PAGE:DIMensions:QUADrant 3

ENTER TEXT
--

COMMENT SCREEN A/B
HCOPy:ITEM:WINDow<1|2>:TEXT <string>

TITLE
HCOPy:ITEM:LABel:TEXT <string>

HARDCOPY DEVICE
HCOPy:DEVice:LANGuage
HPGL | PCL4 | PCL5 | POSTscript | ESCP | WMF|PCX | HP7470 | EPSON24|
EPSON24C | PCL4_C | PCL4_C3 | PCL4_H | PCL4_CH | PCL4_C3H | LASERJ |
DESKJ | DESKJ_C | DESKJ_C3 | DESKJ_H | DESKJ_CH | DESKJC3H | HPGL_LS |
HP7470LS

SETTINGS DEVICE 1/2
HCOPy:DESTination<1|2> <string>
MMEMory:NAME <file_name>
HCOPy:DEVice:PRESet<1|2> ON|OFF
HCOPy:DEVice:RESolution<1|2> 150|300
HCOPy:ITEM:FFEed<1|2>:STATe ON|OFF
HCOPy:PAGE:ORIentation<1|2> LANDscape | PORTrait

ENABLE DEV1/DEV2
The output device to be used is specified as a numeric suffix <1|2> after the command HCOPy:IMMediate

COLOR ON/OFF
HCOPy:DEVice:COLor ON | OFF

3.9.2.6 MEMORY Key Group

CONFIG	
EDIT PATH	MMEMory:MSIS <device> MMEMory:CDIRectory <directory_name>
DELETE	MMEMory:DELete <file_name> MMEMory:RDIRectory <directory_name>
FORMAT DISK	MMEMory:INITialize <msus>
MAKE DIRECTORY	MMEMory:MDIRectory <directory_name>
RENAME	MMEMory:MOVE <file_source>,<file_destination>
SORT MODE	no corresponding IEC/IEEE-bus command
COPY	MMEMory:COPY <file_source>,<file_destination>
SAVE	
DATA SET LIST	--
EDIT COMMENT	MMEMory:COMMent <string>
EDIT NAME	MMEMory:STORe:STATe 1,<file_name>
EDIT PATH	The path is included in the file names.
DATA SET CLEAR	MMEMory:CLEar:STATe 1,<file_name>
DATA SET CLEAR ALL	MMEMory:CLEar:ALL
SELECT ITEMS TO SAVE	--

DEFAULT CONFIG

```
MMEMory:SELect[:ITEM]:DEFault
```

DISABLE ALL ITEMS

```
MMEMory:SELect[:ITEM]:NONE
```

ENABLE ALL ITEMS

```
MMEMory:SELect[:ITEM]:ALL
```

SELECT ITEMS

```
MMEMory:SELect[:ITEM]:GSETup ON|OFF
MMEMory:SELect[:ITEM]:HWSettings ON|OFF
MMEMory:SELect[:ITEM]:TRACe<1...4> ON|OFF
MMEMory:SELect[:ITEM]:LINes[:ACTive] ON|OFF
MMEMory:SELect[:ITEM]:LINes:ALL ON|OFF
MMEMory:SELect[:ITEM]:CSETup ON|OFF
MMEMory:SELect[:ITEM]:HCOPy ON|OFF
MMEMory:SELect[:ITEM]:MACRos ON|OFF
MMEMory:SELect[:ITEM]:SCData ON|OFF
MMEMory:SELect[:ITEM]:TRANsducer[:ACTive] ON|OFF
MMEMory:SELect[:ITEM]:TRANsducer:ALL ON|OFF
```

RECALL

AUTO RECALL

```
MMEMory:LOAD:AUTO 1,<file_name>
```

DATA SET LIST

```
--
```

EDIT NAME

```
MMEMory:LOAD:STATe 1,<file_name>
```

EDIT PATH

The path is included in the file names.

DATA SET CLEAR

```
MMEMory:CLEar:STATe 1,<file_name>
```

DATA SET CLEAR ALL

```
MMEMory:CLEar:ALL
```

SELECT ITEMS TO RECALL

```
--
```

DEFAULT CONFIG

```
MMEMory:SELect[:ITEM]:DEFault
```

DISABLE ALL ITEMS

```
MMEMory:SELect[:ITEM]:NONE
```

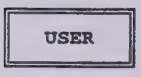
ENABLE ALL ITEMS

```
MMEMory:SELect[:ITEM]:ALL
```

SELECT ITEMS

```
MMEMory:SELect[:ITEM]:GSETup ON|OFF
MMEMory:SELect[:ITEM]:HWSettings ON|OFF
MMEMory:SELect[:ITEM]:TRACe<1...4> ON|OFF
MMEMory:SELect[:ITEM]:LINes[:ACTive] ON|OFF
MMEMory:SELect[:ITEM]:LINes:ALL ON|OFF
MMEMory:SELect[:ITEM]:CSETup ON|OFF
MMEMory:SELect[:ITEM]:HCOPy ON|OFF
MMEMory:SELect[:ITEM]:CDATa ON|OFF
MMEMory:SELect[:ITEM]:MACRos ON|OFF
MMEMory:SELect[:ITEM]:SCData ON|OFF
MMEMory:SELect[:ITEM]:TRANsducer[:ACTive] ON|OFF
MMEMory:SELect[:ITEM]:TRANsducer:ALL ON|OFF
```

3.9.2.7 USER Key Group



MACRO 1...7	no corresponding IEC/IEEE-bus command
DEFINE MACRO	no corresponding IEC/IEEE-bus command
RECORD ON/OFF	no corresponding IEC/IEEE-bus command
DEFINE PAUSE	no corresponding IEC/IEEE-bus command
DELETE MACRO	no corresponding IEC/IEEE-bus command
MACRO TITLE	no corresponding IEC/IEEE-bus command
SELECT MACRO	no corresponding IEC/IEEE-bus command

3.9.3 Vector Signal Analysis Mode (Option FSE-B7)

3.9.3.1 CONFIGURATION Key Group – Digital Demodulation

MODE –

VECTOR ANALYZER --

DIGITAL DEMOD

```
INSTrument[:SELect]   DDEMod
[SENSe:]DDEMod:FORMat   QPSK | PSK | MSK |QAM | FSK
[SENSe:]DDEMod:QPSK:FORMat NORMal | DIFFerential | OFFSet | DPI4
[SENSe:]DDEMod:PSK:NSTate   2 | 8
[SENSe:]DDEMod:PSK:FORMat   NORMal | DIFFerential
[SENSe:]DDEMod:MSK:FORMat   TYPE1 | TYPE2 | NORMal | DIFFerential
[SENSe:]DDEMod:QAM:NSTate   16
[SENSe:]DDEMod:FSK:NSTate   2 | 4
```

DIGITAL STANDARD

```
[SENSe:]DDEMod:PRESet
              GSM| FNADc | RNADc| TETRa| DCS1800| PCS1900| PHS|
              PDCup | PDCDown | APCO25CQPSK | APCO25C4FM|
              CDPD| DECT| CT2| ERMes| MODacom| PWT| TFTS| F16| F322|
              F324|F64| FQCDMA| RQCDMA
```

MODULATION PARAMETERS --

SYMBOL RATE

```
[SENSe:]DDEMod:SRATe <numeric_value>
```

SIDE BAND

```
SENSe:DDEMod:SBANd NORMal|INVerse
```

MEAS FILTER

```
[SENSe:]DDEMod:FILTer:MEASurement    OFF| RCOSine| RRCosine| GAUSsian
```

REFERENCE FILTER

```
[SENSe:]DDEMod:FILTer:REFerence      RCOSine | RRCosine | GAUSsian
```

ALPHA/BT

```
[SENSe:]DDEMod:FILTer:ALPHa <numeric_value>
```

FSK REF DEVIATION

```
CALCulate<1|2>:FSK:DEViation:REFerence <numeric_value>
```

NORMALIZE

```
[SENSe:]DDEMod:NORMalize ON | OFF
```

MEAS RESULT --

MAGNITUDE CAP BUFFER

```
CALCulate<1|2>:FEED  'TCAP'
```

MEAS SIGNAL

```
CALCulate<1|2>:FEED  'XTIM:DDEM:MEAS'
```

REFERENCE SIGNAL

```
CALCulate<1|2>:FEED  'XTIM:DDEM:REF'
```

FREQUENCY	CALCulate<1|2>:FORMat FREQuency
MAGNITUDE	CALCulate<1|2>:FORMat MAGNitude
PHASE	CALCulate<1|2>:FORMat PHASe
PHASE WRAP ON/OFF	CALCulate<1|2>:FORMat PHASe | UPHase
REAL/IMAG PART	CALCulate<1|2>:FORMat RIMag
EYE DIAG [I]	CALCulate<1|2>:FORMat IEYE
EYE DIAG [Q]	CALCulate<1|2>:FORMat QEYE
EYE DIAG TRELLIS	CALCulate<1|2>:FORMat TEYE
EYE LENGTH	DISPlay[:WINDow<1|2>]:TRACe<1...4>:EYE:COUNt <numeric_value>
POLAR [IQ] CONSTELL	CALCulate<1|2>:FORMat CONS
POLAR [IQ] VECTOR	CALCulate<1|2>:FORMat COMP
SYMBOL DISPLAY	CALCulate<1|2>:FEED 'XTIM:DDEM:SYMB'
EYE DIAG [FREQ]	CALCulate<1|2>:FORMat FEYE
EYE LENGTH	CALCulate<1|2>:FORMat FREQuency
FREQUENCY	CALCulate<1|2>:FORMat MAGNitude
MAGNITUDE	CALCulate<1|2>:FORMat MAGNitude
SYMBOL DISPLAY	CALCulate<1|2>:FEED 'XTIM:DDEM:SYMB'
ERROR SIGNAL	CALCulate<1|2>:FEED 'XTIM:DDEM:ERR:MPH'
FREQUENCY	CALCulate<1|2>:FORMat FREQuency
MAGNITUDE	CALCulate<1|2>:FORMat MAGNitude
PHASE	CALCulate<1|2>:FORMat PHASe

REAL/IMAG PART	CALCulate<1|2>:FORMat RIMag
ERROR SIGNAL	CALCulate<1|2>:FEED 'XTIM:DDEM:ERR:MPH'
ERROR VECT MAGNITUDE	CALCulate<1|2>:FEED 'XTIM:DDEM:ERR:VECT'
MAGNITUDE	CALCulate<1|2>:FORMat MAGNitude
POLAR [IQ] CONSTELL	CALCulate<1|2>:FORMat CONS
POLAR [IQ] VECTOR	CALCulate<1|2>:FORMat COMP
SYMB TABLE / ERRORS	CALCulate<1|2>:FEED 'XTIM:DDEM:SYMB'
MEMORY SIZE	[SENSe:]TCAPture:LENGth 1024 | 2048 | 4096 | 8192 | 16384
FRAME LENGTH	[SENSe:]DDEMod:SEARch:TIME <numeric_value>
RESULT LENGTH	[SENSe:]DDEMod:TIME <numeric_value>
POINTS PER SYMBOL	[SENSe:]DDEMod:PRATe 1| 2| 4| 8| 16

3.9.3.2 CONFIGURATION Key Group – Analog Demodulation

MODE	–
VECTOR ANALYZER	--
ANALOG DEMOD	INSTrument[:SELect] ADEMod
MODULATION PARAMETER	--
HIGH PASS AFFILTER	SENSe:FILTer:HPASs[:STATe] ON|OFF SENSe:FILTer:HPASs:FREQuency <numeric_value>
LOW PASS AF FILTER	SENSe:FILTer[:LPASs][:STATe] ON|OFF SENSe:FILTer[:LPASs]:FREQuency <numeric_value>
WEIGHTING AF FILTER	SENSe:FILTer:CCITt[:STATe] ON|OFF SENSe:FILTer:CMESsage[:STATe] ON|OFF
AF COUPL'G AC DC	SENSe:ADEMod:AF:COUPling AC|DC
SQUELCH ON OFF	SENSe:ADEMod:SQUelch[:STATe] ON|OFF

SQUELCH LEVEL	SENSe:ADEMod:SQUelch:LEVel <numeric_value>
SIDE BAND NORM INV	SENSe:ADEMod:SBANd NORMal|INVerse
AM/FM DEEMPH	SENSe:FILTer:DEMPhasis:TCONstant <numeric_value>
PRE DISPL ON OFF	SENSe:FILTer:DEMPhasis:LINK DISPlay|AUDio
DEEMPHASIS ON OFF	SENSe:FILTer:DEMPhasis[:STATe] ON|OFF
MEAS RESULT	--
AM SIGNAL	CALCulate<1|2>:FEED 'XTIM:AM'
FM SIGNAL	CALCulate<1|2>:FEED 'XTIM:FM'
PM SIGNAL	CALCulate<1|2>:FEED 'XTIM:PM'
MODULATION SUMMARY	CALCulate<1|2>:FEED 'XTIM:AMSummary' CALCulate<1|2>:FEED 'XTIM:FMSummary' CALCulate<1|2>:FEED 'XTIM:PMSummary' CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:AM[:RESult?] PPEak | MPEak | MIDDle | RMS CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:FM[:RESult?] PPEak | MPEak | MIDDle | RMS | RDEV CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:PM[:RESult?] PPEak | MPEak | MIDDle | RMS CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:AFRequency[:RESult?] CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:FERRor [:RESult?] CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad:RESult? CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:CARRier[:RESult?]
SUMMARY SETTINGS	--
AVERAGE HOLD ON	SENSe:MSUMmary:AHOLd[:STATe] ON|OFF
SWEEP COUNT	[SENSe:]SWEep:COUNt <numeric_value>
RELUNIT DB %	CALCulate<1|2>:UNIT:POWer DB|PCT
INDICATION ABS REL	SENSe:MSUMmary:MODE ABSolute | RELative
SET REFERENCE	SENSe:MSUMmary:REFerence <numeric_value>
MEAS-> REF	SENSe:MSUMmary:REFerence:AUTO ONCe
MEAS TIME	SENSe:MSUMmary:MTIMe <numeric_value>
SINAD 1kHz ON OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad[:STATe] CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad:RESult?

REAL TIME ON OFF	SENSe:ADEMod:RTIMe[:STATe] ON|OFF
SENSITIV AF OUTPUT	OUTPut:AF:SENSitivity <numeric_value>
VOLUME	SYSTem:SPEaker:VOLume <numeric_value>
DEMOD BANDWIDTH	SENSe:BANDwidth|BWIDth:DEMod <numeric_value>

3.9.3.3 FREQUENCY Key Group

CENTER	[SENSe:]FREQuency:CENTer <numeric_value>
FREQUENCY OFFSET	[SENSe:]FREQuency:OFFSet <numeric_value>

3.9.3.4 LEVEL Key Group

REF	--
REF LEVEL	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RLEVel <numeric_value>
RANGE	–
REF VALUE X AXIS	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:RVALue <numeric_value>
REF VALUE Y AXIS	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RVALue <numeric_value>
Y PER DIV	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:PDIVision <numeric value>
REF VALUE POSITION	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RPOSition 0...100PCT
TIME/DIV	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:TPDivision <numeric_value>
SCALE UNIT	CALCulate<1|2>:UNIT:POWer DBM| V| W| DB| PCT| UNITLESS| DBPW| WATT| DBUV| DBMV | VOLT| DBUA| AMPere
SENSITIV AF OUTPUT	OUTPut:AF:SENSitivity <numeric_value>
VOLUME	SYSTem:SPEaker:VOLume <numeric_value>

3.9.3.5 INPUT Key Group

INPUT	
RF ATTEN MANUAL	INPut:ATTenuation <numeric_value>
ATTEN AUTO LOW DIST	INPut:ATTenuation:AUTO:MODE LDIStortion; INPut:ATTenuation:AUTO ON
ATTEN AUTO LOW NOISE	INPut:ATTenuation:AUTO:MODE LNOise; INPut:ATTenuation:AUTO ON
ATTEN AUTO NORMAL	INPut:ATTenuation:AUTO:MODE NORMal; INPut:ATTenuation:AUTO ON
MIXER LEVEL	INPut:MIXer <numeric value>
INPUT SELECT	--
RF INPUT 50 OHM	INPut:IMPedance 50
RF INPUT 75 OHM/RAM	INPut:IMPedance:CORRection RAM
RF INPUT 75OHM/RAZ	INPut:IMPedance:CORRection RAZ

3.9.3.6 MARKER Key Group

NORMAL	
MARKER 1..2	CALCulate<1|2>:MARKer<1...2>[:STATe] ON | OFF; CALCulate<1|2>:MARKer<1...2>:X <numeric value>; CALCulate<1|2>:MARKer<1...2>:Y?
COUPLED MARKER	CALCulate<1|2>:MARKer<1...2>:COUPling[:STATe] ON | OFF
POLAR MARKER DEG/ RAD	CALCulate<1|2>:UNIT:ANGLe DEG | RAD
POLAR MARKER R/I / MA/PH	CALCulate<1|2>:MARKer<1...2>:READout MPHase | RIMaginary
ALL MARKER OFF	CALCulate<1|2>:MARKer<1...2>:AOFF
MARKER INFO	CALCulate<1|2>:MARKer<1...2>:FUNCtion:DDEMod:RESult? MERM| MEPK| MEPS| PERM| PEPK| PEPS| EVRM| EVPK| EVPS| IQOF| IQIM| ADR| FERR| DEV| FSRM| FSPK| FSPS| RHO| FEPK CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:MAXimum:RESult? CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:PPEak:RESult? CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:MPEak:RESult? CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:MIDDle:RESult? CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:RMS:RESult? CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:MEAN:RESult?

DELTA

ALL DELTA OFF
```
CALCulate<1|2>:DELTamarker<1...4>[:STATe]  ON | OFF
CALCulate<1|2>:DELTamarker<1...4>:X <numeric value>
CALCulate<1|2>:DELTamarker<1...4>:Y?
```

DELTA 1/2
```
CALCulate<1|2>:DELTamarker<1...4>:AOFF
```

DELTA ABS / REL
```
CALCulate<1|2>:DELTamarker<1...4>:MODE  ABSolute | RELative
```

MARKER SEARCH

ACTIVE MKR / DELTA
```
--
```

MIN
```
CALCulate<1|2>:MARKer<1...4>:MINimum[:PEAK]
CALCulate<1|2>:DELTamarker<1...4>:MINimum[:PEAK]
```

SEARCH LIMIT ON/OFF
```
CALCulate<1|2>:MARKer<1...4>:X:SLIMits[STATe] ON | OFF
```

SELECT MARKER
```
--
```

SUMMARY MARKER
```
--
```

+PEAK
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:RESult?
```

-PEAK
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak:RESult?
```

±PEAK/2
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle:RESult?
```

RMS
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:RESult?
```

MAX |PEAK|
```
CALCulate<1|2>:MARKer<1..4>:FUNCtion:SUMMary:MAXimum[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...2>:FUNCtion:SUMMary:MAXimum:RESult?
```

ALL SUM MKR OFF
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AOFF
```

AVERAGE ON / OFF
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AVERage ON | OFF
```

MEAN
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN:RESult?
```

PEAK HOLD ON / OFF
```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PHOLd ON | OFF
```

SWEEP COUNT
```
[SENSe:]SWEep:COUNt <numeric_value>
```

MKR ->

ACTIVE MKR / DELTA

no corresponding IEC/IEEE-bus command

MKR → TRACE

```
CALCulate<1|2>:MARKer<1...4>:TRACe <numeric value>
```

3.9.3.7 LINES Key Group

D LINES

–

DISPLAY LINE 1/2

```
CALCulate:DLINe<1|2>:STATe  ON | OFF;
CALCulate:DLINe<1|2> <numeric_value>
```

REFERENCE LINE

```
CALCulate:RLINe:STATe ON | OFF;
CALCulate:RLINe <numeric_value>
```

THRESHOLD LINE

```
CALCulate:THReshold ON | OFF;
CALCulate:THReshold <numeric_value>
```

TIME LINE 1/2

```
CALCulate:TLINe<1|2>:STATe ON | OFF;
CALCulate:TLINe<1|2> <numeric_value>
```

LIMITS

SELECT LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:NAME <string>;
CALCulate<1|2>:LIMit<1...8>:STATe ON | OFF
```

COPY LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:COPY 1...8 | <name>
```

DELETE LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:DELete
```

X OFFSET

```
CALCulate<1|2>:LIMit<1...8>:CONTrol:OFFset <numeric_value>
```

Y OFFSET

```
CALCulate<1|2>:LIMit<1...8>:UPPer:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:OFFset <numeric_value>
```

EDIT LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:UNIT  DBM| DBPW| WATT| DBUV | DBMV | VOLT |
                                  DBUA | AMPere| DB|
                                  DBUV_MHZ| DBMV_MHZ | DBUA_MHZ|
                                  DEG| RAD| S| HZ| PCT
CALCulate<1|2>:LIMit<1...8>:CONTrol[:DATA] <num_value>,<num_value>..
CALCulate<1|2>:LIMit<1...8>:CONTrol:DOMain   FREQuency|TIME
CALCulate<1|2>:LIMit<1...8>:CONTrol:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:CONTrol:MODE   RELative | ABSolute
CALCulate<1|2>:LIMit<1...8>:CONTrol:UNIT[:TIME] S | SYM
CALCulate<1|2>:LIMit<1...8>:UPPer[:DATA] <num_value>,<num_value>..
CALCulate<1|2>:LIMit<1...8>:UPPer:STATe   ON | OFF
CALCulate<1|2>:LIMit<1...8>:UPPer:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:UPPer:MARGin <numeric_value>
CALCulate<1|2>:LIMit<1...8>:UPPer:MODE   RELative | ABSolute
CALCulate<1|2>:LIMit<1...8>:LOWer[:DATA] <num_value>,<num_value>..
CALCulate<1|2>:LIMit<1...8>:LOWer:STATe ON | OFF
CALCulate<1|2>:LIMit<1...8>:LOWer:OFFset <numeric_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:MARGin <numeric_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:MODE   RELative | ABSolute
```

NEW LIMIT LINE	s. EDIT LIMIT LINE
NAME	CALCulate<1|2>:LIMit<1...8>:NAME <string>
VALUES	no corresponding IEC/IEEE-bus command
DELETE VALUE	no corresponding IEC/IEEE-bus command
INSERT VALUE	no corresponding IEC/IEEE-bus command
SAVE LIMIT LINE	automatically executed during IEC/IEEE-bus operation
SHIFT X LIMIT LINE	CALCulate<1|2>:LIMit<1...8>:CONTrol:SHIFt <numeric_value>
SHIFT Y LIMIT LINE	CALCulate<1|2>:LIMit<1...8>:UPPer:SHIFt <numeric_value> CALCulate<1|2>:LIMit<1...8>:LOWer:SHIFt <numeric_value>

3.9.3.8 TRACE Key Group

TRACE	--
BLANK	DISPlay[:WINDow<1|2>]:TRACe<1...4>[:STATe] OFF
CLEAR/WRITE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE WRITe
CONTINUOUS WRITE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE:CWRite ON|OFF
VIEW	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE VIEW
AVERAGE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE AVERage
MAX HOLD	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE MAXHold
MIN HOLD	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE MINHold
SWEEP COUNT	[SENSe:]SWEep:COUNt <numeric_value>

3.9.3.9 SWEEP Key Group

COUPLING	--
ANALOG BW AUTO	[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO ON | OFF
ANALOG BW MANUAL	[SENSe:]BANDwidth|BWIDth[:RESolution] <numeric_value>
MAIN PLL BANDWIDTH	[SENSe:]BANDwidth|BWIDth:PLL AUTO|HIGH|MEDium|LOW
SWEEP	
CONTINUOUS SWEEP	INITiate:CONTinuous ON
RESULT LENGTH	[SENSe:]DDEMod:TIME <numeric_value>
SINGLE SWEEP	INITiate:CONTinuous OFF
SWEEP COUNT	[SENSe:]SWEep:COUNt <numeric_value>

3.9.3.10 SWEEP Key Group - Digital Demodulation

TRIGGER	
FREE RUN	TRIGger[:SEQuence]:SOURce IMMediate
SLOPE POS/NEG	TRIGger[:SEQuence]:SLOPe POSitive|NEGative
VIDEO	TRIGger[:SEQuence]:SOURce VIDeo TRIGger[:SEQuence]:LEVel:VIDeo <numeric value>
FIND BURST	[SENSe:]DDEMod:SEARch:PULSe:STATe ON ! OFF
FIND SYNC ON/OFF	[SENSe:]DDEMod:SEARch:SYNC:STATe ON | OFF
SYNC OFFSET	[SENSe:]DDEMod:SEARch:SYNC:OFFSET <numeric_value>

SYNC PATTERN	--
DELETE PATTERN	--
SELECT PATTERN	--
SYNC PATTERN	--
COMMENT	--
NAME	--
NEW SYNC PATTERN	[SENSe:]DDEMod:SEARch:SYNC:PATTern <string>
SAVE PATTERN	automatically executed during IEC/IEEE-bus operation
VALUE	[SENSe:]DDEMod:SEARch:SYNC:PATTern <string>
EDIT SYNC PATTERN	[SENSe:]DDEMod:SEARch:SYNC:PATTern <string>

3.9.3.11 SWEEP Key Group - Analog Demodulation

TRIGGER	
FREE RUN	TRIGger[:SEQuence]:SOURce IMMediate
VIDEO	TRIGger[:SEQuence]:SOURce VIDeo TRIGger[:SEQuence]:LEVel:VIDeo <numeric value>
EXTERN	TRIGger[:SEQuence]:SOURce EXTernal TRIGger[:SEQuence]:LEVel[:EXTernal] <numeric value>
AF SIGNAL	TRIGger[:SEQuence]:SOURce AF
SLOPE POS/NEG	TRIGger[:SEQuence]:SLOPe POSitive|NEGative
TRIGGER OFFSET	TRIGger[:SEQuence]:HOLDoff <numeric_value>

3.9.4 Tracking Generator Mode (Option FSE-B8...B11)

3.9.4.1 CONFIGURATION Key Group

MODE	
TRACKING GEN	--
PWR OFFSET	SOURce:POWer[:LEVel][:IMMediate]:OFFSet <numeric value>
SOURCE ON/OFF	OUTPut:[:STATe] ON | OFF
SOURCE PWR	SOURce:POWer[:LEVel][:IMMediate][:AMPLitude] <numeric value>
SOURCE CAL	--
NORMALIZE	[SENSe:]CORRection[:STATe] ON | OFF
REF VALUE POSITION	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RPOSition 0...100PCT
REF VALUE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RVALue <numeric_value>
CAL REFL THROUGH	[SENSe:]CORRection:METHod TRANsmission [SENSe:] CORRection:COLLect[:ACQuire] THRough
CAL REFL OPEN	[SENSe:]CORRection:METHod REFLexion [SENSe:]CORRection:COLLect[:ACQuire] OPEN
CAL REFL SHORT	[SENSe:]CORRection:METHod REFLexion [SENSe:]CORRection:COLLect[:ACQuire] THRough
FREQUENCY OFFSET	SOURce:FREQuency:OFFSet <numeric value>
MODULATION	--
EXT ALC	SOURce:POWer:ALC:SOURce INTernal | EXTernal
EXT AM	SOURce:AM:STATe ON | OFF
EXT FM	SOURce:FM:STATe ON | OFF
EXT I/Q	SOURce:DM:STATe ON | OFF

3.9.5 TV-Demodulation Mode (Option FSE-B3)

3.9.5.1 CONFIGURATION Key Group

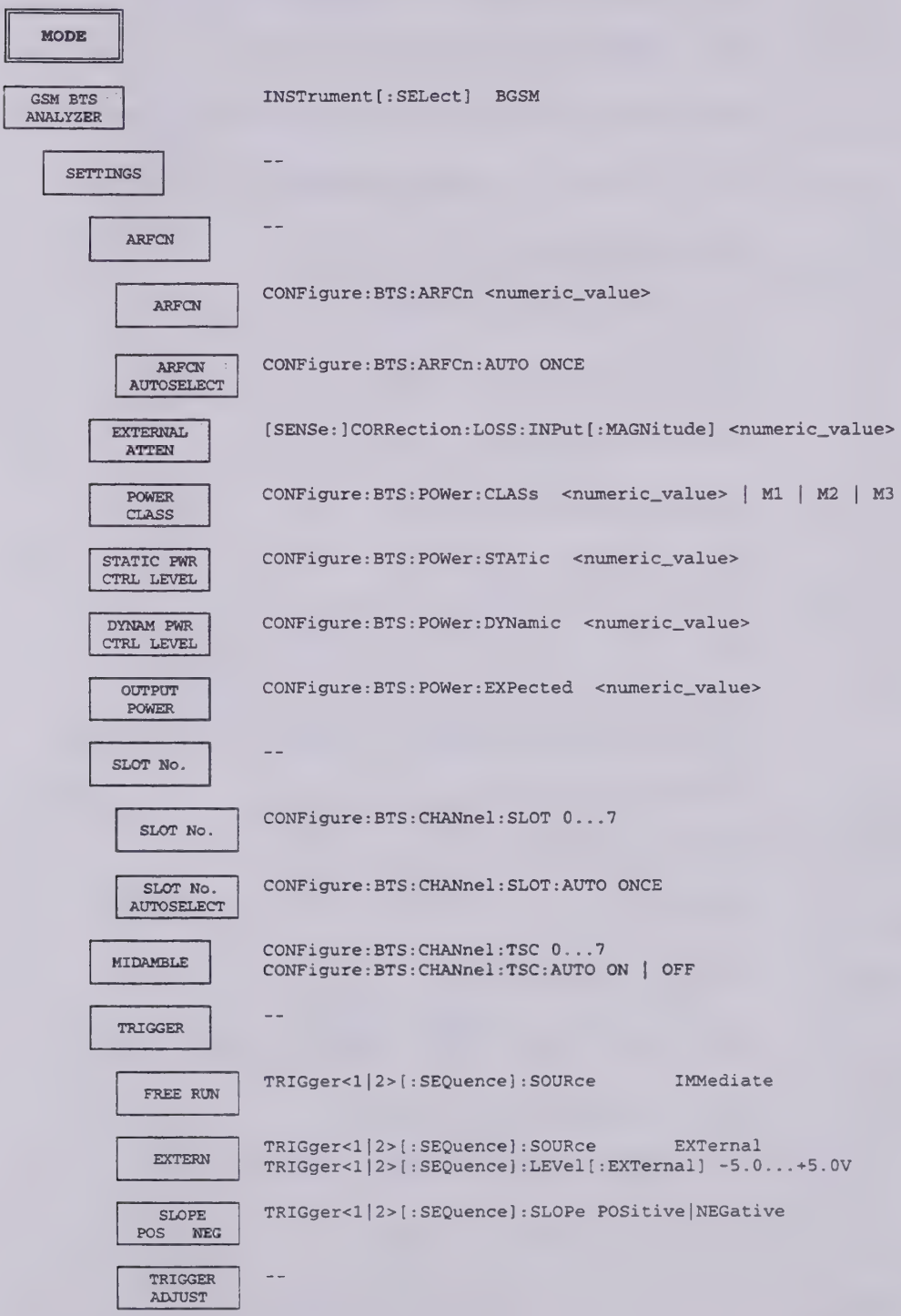
MODE	
TV DEMOD	[SENSe:]TV[:STATe] ON | OFF
525 LINE SYSTEM	TRIGger[:SEQuence]:VIDeo:FORMat:LPFRame 525
625 LINE SYSTEM	TRIGger[:SEQuence]:VIDeo:FORMat:LPFRame 625
PICT/SOUND OFFSET	[SENSe:]TV:PSOFfset <numeric_value>
TV DEMOD OFF	[SENSe:]TV[:STATe] ON | OFF
VIDEO POL NEGATIVE	TRIGger[:SEQuence]:VIDeo:SSIGnal:POLarity NEGative
VIDEO POL POSITIVE	TRIGger[:SEQuence]:VIDeo:SSIGnal:POLarity POSitive

3.9.5.2 SWEEP Key Group

TRIGGER	
TV	TRIGger[:SEQuence]:SOURce TV
TV TRIGGER SETTINGS	--
VERT SYNC	TRIGger[:SEQuence]:VIDeo:FIELd:SELect ALL
HOR SYNC	TRIGger[:SEQuence]:VIDeo:LINE:NUMBer <numeric_value>
VERT SYNC EVEN FIELD	TRIGger[:SEQuence]:VIDeo:FIELd:SELect EVEN
VERT SYNC ODD FIELD	TRIGger[:SEQuence]:VIDeo:FIELd:SELect ODD

3.9.6 GSM BTS Analysis Mode (Option FSE-K11)

3.9.6.1 CONFIGURATION Key Group



FRAME COARSE	TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe <numeric_value>
FRAME FINE	TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe <numeric_value>
AUTO FRAME ADJUST	TRIGger[:SEQuence]:SYNChronize:ADJust:FRAMe:AUTO ONCE
SLOT ADJUST	TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT <numeric_value>
AUTO SLOT ADJUST	TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT:AUTO ONCE
DEFAULT SETTINGS	CONFigure:BTS:PRESet
P-GSM 900	CONFigure:BTS:NETWork[:TYPE] PGSM
E-GSM 900	CONFigure:BTS:NETWork[:TYPE] EGSM
DCS 1800	CONFigure:BTS:NETWork[:TYPE] DCS
PCS 1900	CONFigure:BTS:NETWork[:TYPE] PCS
PHASE II I	CONFigure:BTS:NETWork:PHASe 1|2
LIMIT MARGIN	CALCulate<1|2>:LIMit<1...8>:MARGin <numeric_value>
SPURIOUS	CONFigure:SPURious[:IMMediate] CALCulate:LIMit:SPURious? TXBand | OTXBand | RXBand CALCulate:LIMit:SPURious:FAILs? TXBand | OTXBand | RXBand
START LIST	READ:SPUR[:ALL]?
START LIST SGL STEP	ABORT;READ:SPUR:STEP?
CONT SGL STEP LIST	READ:SPUR:STEP?
TX SUPPR ON OFF	CONFigure:BTS:TXSupp ON | OFF
RX BAND GAIN	[SENSe:]CORRection:RXGain:INPut[:MAGNitude] <numeric_value>
SWEEP COUNT	CONFigure:SPURious:COUNt <numeric_value>
SWP COUNT TX / <> TX	CONFigure:SPURious:RANGe TXBand | OTXBand
SWP COUNT RX BAND	CONFigure:SPURious:RANGe RXBand
SET TO STANDARD	--

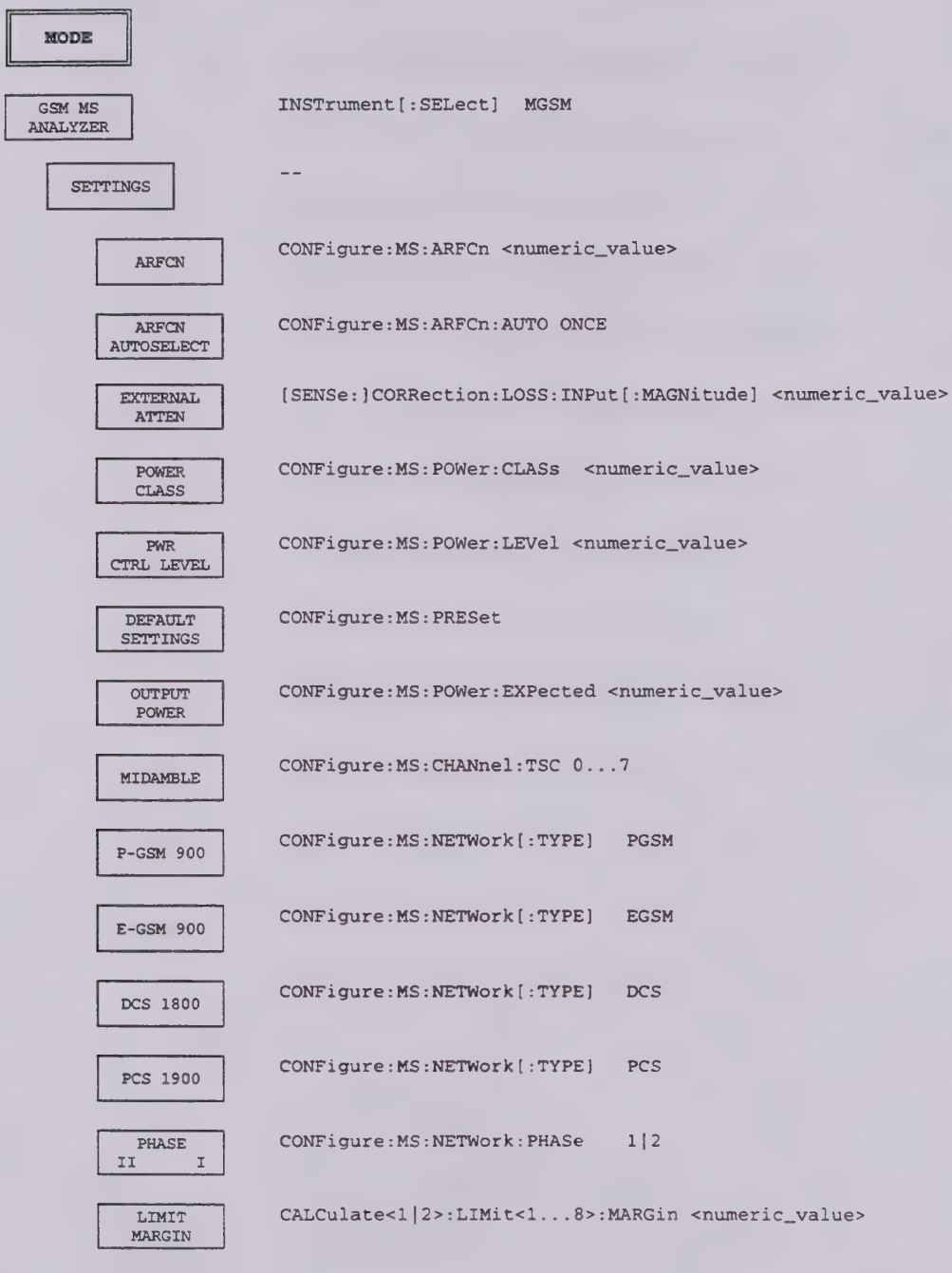
TX BAND	CONFigure:SPURious:RANGe TXBand
<> TX BAND	CONFigure:SPURious:RANGe OTXBand
RX BAND	CONFigure:SPURious:RANGe RXBand
BTS SFH ON OFF	CONFigure:BTS:CHANnel:SFH ON | OFF
COSITING	CONFigure:BTS:COSiting ON | OFF
TRANSIENT SPECTRUM	CONFigure:SPECtrum:SWITching[:IMMediate] CALCulate:LIMit:SPECtrum:SWITching? ARFCn|TXBand|RXBand|COMBined CALCulate:LIMit:SPECtrum:SWITching:FAILs? ARFCn|TXBand|RXBand|COMBined
SINGLE FREQ SWEEP	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS FREQ SWEEP	INITiate:CONTinuous ON; INITiate [:IMMediate]
START LIST	READ:SPECtrum:SWITching[:ALL]?
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
BTS SFH ON OFF	CONFigure:BTS:CHANnel:SFH ON | OFF
MODULATION SPECTRUM	CONFigure:SPECtrum:MODulation[:IMMediate] CALCulate:LIMit:SPECtrum:MODulation? ARFCn|TXBand|RXBand|COMBined CALCulate:LIMit:SPECtrum:MODulation:FAILs? ARFCn|TXBand|RXBand|COMBined CALCulate:LIMit:SPECtrum:MODulation:EXCeptions? ARFCn|TXBand|RXBand|COMBined
SINGLE FREQ SWEEP	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS FREQ SWEEP	INITiate:CONTinuous ON; INITiate [:IMMediate]
START LIST	READ:SPECtrum:MODulation[:ALL]?
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
ARFCN ±1.8 MHZ	CONFigure:SPECtrum:MODulation:RANGe ARFCn

TX BAND	CONFigure:SPECtrum:MODulation:RANGe TXBand
±1.8 MHZ / TX BAND	CONFigure:SPECtrum:MODulation:RANGe COMBined
RX BAND	CONFigure:SPECtrum:MODulation:RANGe RXBand
RX BAND GAIN	[SENSe:]CORRection:RXGain:INPut[:MAGNitude] <numeric_value>
TRIGGER ADJUST	see SETTINGS submenu
POWER VS TIME	CONFigure: BURSt:PTEMplate[:IMMediate] CALCulate:LIMit:BURSt:PTEMplate?
SINGLE	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS	INITiate:CONTinuous ON; INITiate [:IMMediate]
FULL BURST	CONFigure: BURSt:PTEMplate:SELect FULL
BURST HIGH RESOLUTION	CONFigure: BURSt:PTEMplate:SELect TOP
RISING	CONFigure: BURSt:PTEMplate:SELect RISing
FALLING	CONFigure: BURSt:PTEMplate:SELect FALLing
MEAS BANDWIDTH	[SENSe:]BANDwidth|BWIDth[:RESolution] DEF | 300 kHz | 1 MHz
SYNC TO MIDAMBLE	TRIGger[:SEQuence]:SYNChronize:SOURce FRAMe | TSC
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
TRIGGER ADJUST	see SETTINGS submenu
CARRIER POWER	CONFigure: BURSt:POWer[:IMMediate] CALCulate:LIMit:BURSt:POWer?
MEAS MAX OUTPUT PWR	READ:BURSt:POWer?
INC STATIC PWR CTRL	READ:BURSt:POWer:STATic?

INC DYNAM PWR CTRL	READ:BURSt:POWer:DYNamic?
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
CONDITIONS NORM EXTR	CONFigure: BURSt:POWer:CONDition NORMal | EXTReme
SYNC TO MIDAMBLE	TRIGger[:SEQuence]:SYNChronize:SOURce FRAMe | TSC
TRIGGER ADJUST	see SETTINGS submenu
PHASE/FREQ ERROR	CONFigure: BURSt:PFERror[:IMMediate]
SINGLE	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS	INITiate:CONTinuous ON; INITiate [:IMMediate]
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--

3.9.7 GSM MS Analysis Mode (Option FSE-K10)

3.9.7.1 CONFIGURATION Key Group



TRIGGER	--
FREE RUN	TRIGger<1|2>[:SEQuence]:SOURce IMMediate
VIDEO	TRIGger<1|2>[:SEQuence]:SOURce VIDeo
EXTERN	TRIGger<1|2>[:SEQuence]:SOURce EXTernal TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal] -5.0...+5.0V
RF POWER	TRIGger<1|2>[:SEQuence]:SOURce RFPower
SLOPE POS NEG	TRIGger<1|2>[:SEQuence]:SLOPe POSitive|NEGative
TRIGGER ADJUST	--
COURSE ADJUST	TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT <numeric_value>
FINE ADJUST	TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT <numeric_value>
AUTO ADJUST	TRIGger[:SEQuence]:SYNChronize:ADJust:SLOT:AUTO ONCE
SPURIOUS	CONFigure:SPURious[:IMMediate] CALCulate:LIMit:SPURious? TXBand | OTXBand | IDLeband CALCulate:LIMit:SPURious:FAILs? TXBand | OTXBand | IDLeband
START LIST	READ:SPUR[:ALL]?
START LIST SGL STEP	ABORT;READ:SPUR:STEP?
CONT SGL STEP LIST	READ:SPUR:STEP?
TX SUPPR ON OFF	CONFigure:MS:TXSupp ON | OFF
SWEEP COUNT	CONFigure:SPURious:COUNt <numeric_value>
TX BAND	CONFigure:SPURious:RANGe TXBand
<> TX BAND	CONFigure:SPURious:RANGe OTXBand
IDLE MODE	CONFigure:SPURious:RANGe IDLeband

TRANSIENT SPECTRUM	CONFigure:SPECtrum:SWITching[:IMMediate] CALCulate:LIMit:SPECtrum:SWITching? ARFCn|TXBand|RXBand|COMBined CALCulate:LIMit:SPECtrum:SWITching:FAILs? ARFCn|TXBand|RXBand|COMBined
SINGLE FREQ SWEEP	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS FREQ SWEEP	INITiate:CONTinuous ON; INITiate [:IMMediate]
START LIST	READ:SPECtrum:SWITching[:ALL]?
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
TRIGGER ADJUST	see SETTINGS submenu
MODULATION SPECTRUM	CONFigure:SPECtrum:MODulation[:IMMediate] CALCulate:LIMit:SPECtrum:MODulation? ARFCn|TXBand|RXBand|COMBined|DCSRx1800 CALCulate:LIMit:SPECtrum:MODulation:FAILs? ARFCn|TXBand|RXBand|COMBined|DCSRx1800 CALCulate:LIMit:SPECtrum:MODulation:EXCeptions? ARFCn|TXBand|RXBand|COMBined|DCSRx1800
SINGLE FREQ SWEEP	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS FREQ SWEEP	INITiate:CONTinuous ON; INITiate [:IMMediate]
START LIST	READ:SPECtrum:MODulation[:ALL]?
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
ARFCN ± 1.8 MHz	CONFigure:SPECtrum:MODulation:RANGe ARFCn
TX BAND	CONFigure:SPECtrum:MODulation:RANGe TXBand
±1.8 MHZ TX BAND	CONFigure:SPECtrum:MODulation:RANGe COMBined

RX BAND GSM 900	CONFigure:SPECtrum:MODulation:RANGe RXBand
RX BAND DCS 1800	CONFigure:SPECtrum:MODulation:RANGe DCSRx1800
TRIGGER ADJUST	see SETTINGS submenu
RX BAND GAIN	[SENSe:]CORRection:RXGain:INPut[:MAGNitude] <numeric_value>
POWER VS TIME	CONFigure: BURSt:PTEMplate[:IMMediate] CALCulate:LIMit:BURSt:PTEMplate?
SINGLE	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS	INITiate:CONTinuous ON; INITiate [:IMMediate]
FULL BURST	CONFigure: BURSt:PTEMplate:SELect FULL
BURST HIGH RESOLUTION	CONFigure: BURSt:PTEMplate:SELect TOP
RISING	CONFigure: BURSt:PTEMplate:SELect RISing
FALLING	CONFigure: BURSt:PTEMplate:SELect FALLing
MEAS BANDWIDTH	[SENSe:]BANDwidth|BWIDth[:RESolution] DEF | 300 kHz | 1 MHz
SYNC TO MIDAMBLE	TRIGger[:SEQuence]:SYNChronize:SOURce FRAMe | TSC
NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
TRIGGER ADJUST	see SETTINGS submenu
CARRIER POWER	CONFigure: BURSt:POWer[:IMMediate] CALCulate:LIMit:BURSt:POWer?
MEAS MAX OUTPUT PWR	READ:BURSt:POWer?
INC PWR CTRL LEVEL	READ:BURSt:POWer:LEVel?

NO. OF BURSTS	--
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--
CONDITIONS NORM EXTR	CONFigure: BURSt:POWer:CONDition NORMal | EXTReme
SYNC TO MIDAMBLE	TRIGger[:SEQuence]:SYNChronize:SOURce FRAMe | TSC
TRIGGER ADJUST	see SETTINGS submenu
PHASE/FREQ ERROR	CONFigure: BURSt:PFERror[:IMMediate]
SINGLE	INITiate:CONTinuous OFF; INITiate [:IMMediate]
CONTINUOUS	INITiate:CONTinuous ON; INITiate [:IMMediate]
NO. OF BURSTS	
NO. OF BURSTS	CONFigure:SPECtrum:SWITching:COUNt <numeric_value>
SET TO STANDARD	--

5 Checking Rated Specifications

5.1 Preliminary Remarks:

- Switch off FSE before removing or inserting modules.
- Prior to instrument power-up check the setting of the AC supply voltage selector (230 V).
- Section 5.3.1 describes the final adjustment of FSE, section 5.3.2 (digital modulation) checking of FSE data-sheet specifications. For applicable test values and tolerances see interface data.
- Measure the parameters after a warm-up period of at least 30 min. and internal calibration of FSE.
- Unless specified otherwise all settings are made after a PRESET.
- Conventions for setting the FSE during measurements:

  [***<KEY>***] Press a key on the front panel, eg [SPAN]

  [<SOFTKEY>] Press a softkey, eg [MARKER -> PEAK]

  [<nn unit>] Enter a value and terminate by entering the unit, eg [12 kHz]

  Successive entries are separated by [:], eg [***SPAN***: 15 kHz]

5.2 Test Equipment Required

Item	Instrument type	Required characteristics	Suitable R&S instrument	Order No.	Uses
1	Signal generator with I/Q modulation 9 kHz to 1.9 GHz,	Phase noise at 498 MHz: < -123 dBc/Hz at 10 kHz < -123 dBc/Hz at 100 kHz < -140 dBc/Hz at 1 MHz EVM < 0.5 % after calibration	SMHU 58	835.8011.58	
2	Power meter	100 kHz to 26.5 GHz, error < 0.1 dB	NRVD with sensors NRV-Z7 (FSEA/B) NRV-Z6 (FSEM)	0857.8008.02 0828.5210.22 0828.5010.02	
3	Power splitter	10 MHz to 3.5 GHz (FSEA), 10 MHz to 7 GHz (FSEB), 10 MHz to 26.5 GHz (FSEM)		---	
4	RF step attenuator		RSP	0831.3515.02	
5	Arbitrary waveform generator	Sampling rate ≥ 40 MHz, can be calibrated	ADS (64-k memory) + ADS-B1	1012.4002.02 1013.5748.92	
6	Control software for ADS		IQSIM V4.0 or higher		
7	Test files		FSE-B7 test data	1066.4452.00	
8	FSE service kit		FSE-Z1	1066.3862.02	

5.3 Test Procedure

5.3.1 Final Adjustment

5.3.1.1 Adjustment of 10-MHz Filter in the Spectrum Analyzer Mode

- Operate 2nd IF CONVERTER module outside the unit using the FSE service kit.
- Remove RF cover at component side and place a test cover onto the VCO case.
- Connect RF input to calibration source (SETUP→SERVICE→INPUT CAL).
- Check filter curve with the settings below:
  Mode: Analyzer
  Center: 120 MHz
  Span: 20 MHz
  RBW: 10 MHz
  VBW: 100 kHz
  Range: Log 10 dB
  Ref. Level: - 38 dBm
- Measure level at 120 MHz and note down measurement result.
- Adjust filter curve using C21, C138, C140, C229, C141, C143 and C 144 so that the following conditions are met:
  Characteristic symmetrical to center frequency and flat at center frequency. Minimum requirement: < 1 dB attenuation at ± 2 MHz compared to minimum attenuation.
  3-dB bandwidth:..... 9 MHz to 12.5 MHz.
  Level at center frequency: ..... previous value ±0.5 dB.
- Screw on RF cover and fit module in the unit.
- After the adjustment trigger a total calibration.

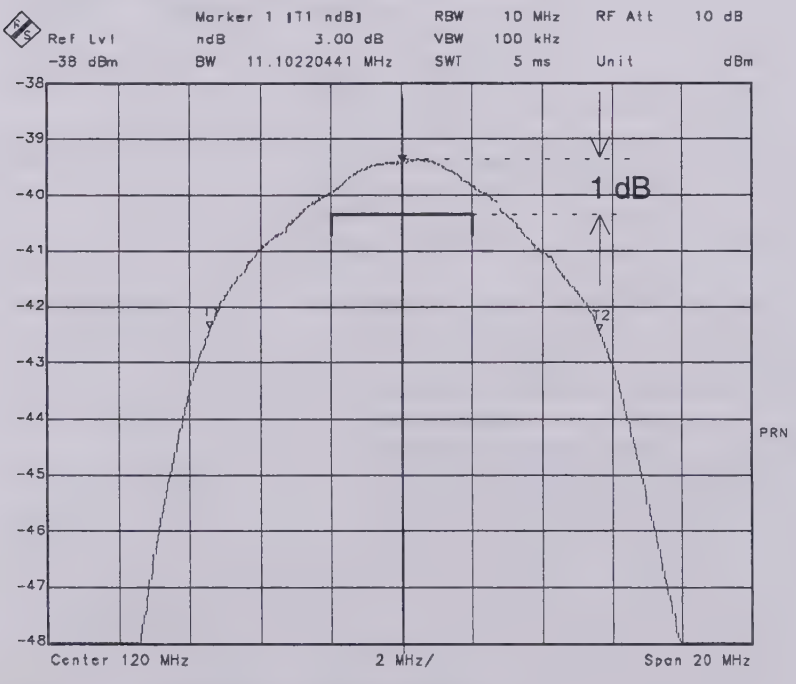


Fig. 5-1 Example of a filter adjustment

5.3.1.2 Adjustment and Check of Level Display in the Vector Analyzer Mode (Mag Cap Buffer)

Test setup: Apply 120-MHz signal from signal generator to FSE input, level -10 dBm

Settings on FSE:

Mode: Vector analyzer

Digital standard	GSM
MEAS RESULT	MAG CAP BUFFER
CENTER	120 MHz
RBW	10 MHz
REF LVL	-7 dBm
RANGE:REF VALUE	-7 dBm
Input	Low Dist

Adjustment:

- ➢ *[**MARKER SEARCH**: Modulation Marker: RMS]*
- ➢ Read RMS marker level and check for:..... 40 dBm ±0.5 dB,
- ➢ Select INPUT:LOW NOISE.
- ➢ Adjust marker level with R144 on I/O board to the same level as measured with LOW DIST ..... ±0.03 dB.
- ➢ Switch on INPUT: ATTEN AUTO NORMAL.
- ➢ Adjust marker level with R 362 on the I/O board to the same level as measured with LOW DIST ..... ±0.03 dB.
- ➢ Trigger I/Q calibration

5.3.2 Digital Demodulation

5.3.2.1 Absolute Accuracy at 120 MHz

Test setup: Connect signal generator to RF input of FSE via a power splitter.
Level -4 dBm
Frequency 120 MHz

Settings on FSE:
[REF LVL:-7 dBm]
[CENTER FREQUENCY:20 MHz]
[MODE: VECTOR ANALYZER: DIGITAL STANDARD:GSM]
[MEAS RESULT: MAG CAP BUFFER]
[REF VALUE: -7 dBm]
[Memory Size: 8000 points: FraME LEngth: 400 Symbols]
[RESULT LENGTH 400 SYMBOLS: Find Burst oFF]
[SUMMARY MKR ON, AVG/HOLD ON, SWEEP COUNT: 10, SINGLE SWEEP]

Measurement:
- Comparison measurement with NRVD power sensor:
  - *[CENTER: f_{Freq}]*
    [MODULATION MARKER: RMS]
    Read marker level.
  - Nominal value ..... level at power meter
    The difference between the level displays of power meter and FSE is the absolute error (at 120 MHz only). It is used as reference error.
    Nominal value (absolute) : .....< ±0.4 dB deviation*)

5.3.2.2 Display Linearity

Test equipment:
Signal generator
RF Step Attenuator RSG, DC correction

Test setup: Connect signal generator via the attenuator to the RF input of FSE.
Frequency 120 MHz
Level -4 dBm
Level at FSE input approx. -10 dBm

Measurement:
- Reference = 0 dB below REF LVL. (ref. = reference attenuation)
  - Increase attenuation of step attenuator ATT_{RSG} by 50 dB in 5-dB steps.
  - Read level on FSE *[MODULATION MARKER:RMS]* for each step.
    Nominal level ..... -10 dBm - (ATT_{RSG} - ref.)
    Permissible deviation up to 10 dB attenuation: .....0.2 dB
    Permissible deviation up to 30 dB: .....0.85 dB
    Permissible deviation up to 50 dB: .....1.5 dB

*) Compared to FSE calibration, the absolute error may be 0.1 dB higher so that a total error of 1 dB is still obtained. This applies because the linearity error of FSE-B7, which corresponds to the log error (0.3 dB), is only max. 0.2 dB.

5.3.2.3 Checking the Dynamic Range for Burst Measurements

Test equipment: Signal generator (SMHU58), modulated with ADS

Test setup: Connect signal generator to RF input of FSE (level -10 dBm)

Settings on FSE:

- *[REF LVL:-10 dBm]*
  [MODE: VECTOR ANALYZER]
- Set required modulation standard according to table:
  - *[MEAS RESULT: MAG CAP BUFFER]*
  - *[REF VALUE:-10 dBm]*
  - *[Memory Size: 8000 points, FraME LEngth: 400 Symbols]*
  - *[RESULT LENGTH: 400 SYMBOLS, 4 points per Symbol, Find Burst oN],*
  - *[INPUT:ATTEN: LOW NOISE]*
- Increase level of signal generator (individually for each standard) in 1-dB steps until IFOVLD is displayed, then reduce by 1 dB.
- Determine dynamic range MAG CAP BUFFER according to table:
  - Set marker 1 to maximum with PEAK SEARCH.
  - Note down displayed value.
  - Set signal generator level to minimum (-139 dBm) and deduct displayed value of FSE summary marker MEAN. The difference between the displayed values is the available dynamic range.
  - *[SUMMARY MKR ON, SUMMARY MKR⇓: MEAN, AVG/HOLD ON, SWEEP COUNT: 10, SINGLE SWEEP]*

	Dynamic range of MAG CAP BUFFER
GMSK (GSM standard) **Symbol rate: 270.833 kHz,** **MEAS FILTER: NONE** **REF FILTER: GAUSS** **B*T: 0.3** **f_{RF} = 960 MHz** **RESULT LENGTH:** **400 symbols**	> 67.3 dB Typ. 70.3 dB
π/4-DQPSK **(TETRA standard)** **Symbol rate: 18 kHz,** **MEAS FILTER: ROOT COS** **REF FILTER: COS** **B*T: 0.35** **f_{RF} = 900 MHz**	> 72 dB typ. 75 dB

5.3.2.4 Checking the Residual Error (no FSK signals)

Test equipment:

4-GHz signal generator (SMHU58, externally synchronized with DCF77), modulated with ADS (also externally synchronized) via IQSIM software.

Note: *Prior to measuring the residual error, calibrate the I/Q modulator on SMHU 58 (Shift Special 320) and adjust the offset on the ADS (Special function/DIAG/CAL 0).*

Calibration of signal generator:

- Adjust the carrier suppression to > 65 dB on both channels by varying the CAL D/A converters (output frequency 100 kHz, 1 V on the two ADS channels, phase 90°).
- Remove the imbalance on the I and Q channels using special function 301 and I>Q and also the QUAD offset by adjusting the 2nd sideband (carrier + 100 kHz) to > 65 dB.
- After setting a DIGITAL STANDARD on the ADS, program again the setting values of the two CAL D/A converters.

Test setup:

Connect signal generator to RF input of FSE (frequency 500 MHz with -20 dBm)
Synchronize FSE externally with DCF 77.

Settings on FSE:

Set required modulation standard according to table and also *[MEAS RESULT: SYMB TABLE/ERRORS], [TRACE: AVERAGE, SWEEP COUNT: 10, SINGLE SWEEP]*

Measurement:

- Generate the standard test signals (see table below) on the ADS with I/Q SIM and check the residual error as required by the model. To do so set the frequency of signal generator and FSE to the f_{RF} indicated in the table.

FSEA30 + B7 (or FSEA20 + B4 + B7):

	ADS test signal
GMSK **Symbol rate: 270.833 kHz,** **f_{RF} = 960 MHz,** ***[DIGITAL STANDARD: GSM],*** ***[TRIGGER:FIND SYNC ON]***	GSMSTAN.IQS
GMSK **Symbol rate: 270.833 kHz,** **f_{RF} = 1900 MHz** ***[DIGITAL STANDARD:PCS1900]***	GSMSTAN.IQS
π/4-DQPSK **Symbol rate: 24.3 kHz** **f_{RF} = 894 MHz,** ***[DIGITAL STANDARD: NADC,*** ***TRIGGER:FIND SYNC ON]***	NADC_S1.IQS
π/4-DQPSK, **f_{RF} = 900 MHz** **Symbol rate 18 kHz** ***[DIGITAL STANDARD:TETRA]***	TETRA2.IQS
π/4-DQPSK **Symbol rate: 21 kHz** **f_{RF} = 900 MHz** ***[DIGITAL STANDARD:PDC]-***	PDC1.IQS
π/4-DQPSK **Symbol rate: 192 kHz,** **f_{RF} = 1900 MHz** ***DIGITAL STANDARD: PHS***	PHS1.IQS
π/4-DQPSK **Symbol rate: 576 kHz,** **f_{RF} = 1900 MHz** ***[DIGITAL STANDARD: WCPE]***	WCPE1.IQS
QPSK **Symbol rate 1.2288 MHz** ***[DIGITAL STANDARD: QCDMA FORWARD CH]***	QCDMA_F1.IQS
OQPSK **Symbol rate 1.2288 MHz** ***[DIGITAL STANDARD: QCDMA REVERSE CH]***	QCDMA_R1.IQS

5.3.2.5 Checking the Residual Error (FSK signals)

Test equipment: Signal generator (SMHU58, externally synchronized with DCF77), modulated with ADS (also externally synchronized) via IQSIM software. Calibrate as described in section 5.3.2.4.

Test setup: Connect signal generator to RF input of RSE.
(frequency 500 MHz with -10 dBm)
Synchronize FSE externally with DCF 77.

Settings on FSE: Set required modulation standard according to table and also *[RESULT DISPLAY: SYMB TABLE/ERRORS, TRACE: AVERAGE, SWEEP ..... SINGLE SWEEP, INPUT:ATTEN MANUAL:LOW NOISE, REF LEVEL:-10DBM]*

Measurement: Generate the standard test signals (see table below) on the ADS with I/Q SIM and check residual error as required by the model.

	ADS test signal
4-FSK Symbol rate: 3.125 kHz, f_{RF} = 169.8 MHz *[DIGITAL STANDARD:ERMES]*	ERMES1.IQS
2-FSK **Symbol rate 72 kHz** f_{RF} = 900 MHz *[DIGITAL STANDARD: CT2_1]*	CT2_1.IQS
2-FSK Symbol rate: 1.152 MHz, f_{RF} = 1900 MHz *[DIGITAL STANDARD:DECT]*	DECT1.IQs

5.4 Performance Test Report

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
1	Absolute accuracy of level display	5.4.1.1.1	-0.4	.....	+0.4	dB
2	Linearity of level display	5.4.1.1.1				
	a = 10 dB		-0.2	.....	+0.2	dB
	a=30 dB		-0.85	.....	+0.85	dB
	a=50 dB		-1.5	.....	+1.5	dB
3	Useful dynamic range GSM:		67.3	.....		dB
	NADC:		72	.....		dB
Residual error - no FSK FSEA30 or FSEA20 incl. FSE-B4:						
4	**PCS1900**					
	EVM rms:		---	.....	1	%
	Magnitude error rms:		---	.....	1	%
	Phase error rms:		---	.....	0.5	°
	Phase error pk:		---	.....	2.1	°
	I/Q offset:		---	.....	0.2	%
	Freq. error:		-1.45	.....	1.45	Hz
5	**NADC (PDC, TETRA)**					
	EVM rms:		---	.....	0.5	%
	EVM pk:		---	.....	2.1	%
	Magnitude error rms:		---	.....	0.5	%
	I/Q offset:		---	.....	0.2	%
	Freq. error:		-0.22	.....	+ 0.22	Hz

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
6	**PHS**					
	EVM rms:		---	.....	1	%
	EVM pk:		---	.....	4.5	%
	Magnitude error rms:		---	.....	1	%
	I/Q offset:		---	.....	0.2	%
	Freq. error:		-1.06	.....	+ 1.06	Hz
7	**QCDMA FORWARD CH:**					
	EVM rms:		---	.....	2	%
	EVM pk:		---	.....	9	%
	Magnitude error rms:		---	.....	2	%
	I/Q offset:		---	.....	0.2	%
	Freq. error:		-6.2	.....	+ 6.2	Hz
	RHO factor		0.9995	.....	---	---
8	**QCDMA REVERSE CH:**					
	EVM rms:		---	.....	2	%
	EVM pk:		---	.....	9	%
	Magnitude error rms:		---	.....	2	%
	I/Q offset:		---	.....	0.2	%
	Freq. error:		-6.2	.....	+ 6.2	Hz
	RHO factor		0.9995	.....	---	---

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
Residual error - no FSK FSEA20 (without FSE-B4):						
9	**PCS1900**					
	EVM rms:		---	.....	3	%
	Magnitude error rms:		---	.....	3	%
	Phase error rms:		---	.....	1.5	°
	Phase error pk:		---	.....	6.3	°
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-4.35	.....	4.35	Hz
10	**NADC (PDC, TETRA)**					
	EVM rms:		---	.....	1.5	%
	EVM pk:		---	.....	6.3	%
	Magnitude error rms:		---	.....	1.5	%
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-0.66	.....	+ 0.66	Hz
11	**PHS**					
	EVM rms:		---	.....	3	%
	EVM pk:		---	.....	12.5	%
	Magnitude error rms:		---	.....	3	%
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-3.18	.....	+ 3.18	Hz
12	**QCDMA FORWARD CH:**					
	EVM rms:		---	.....	6	%
	EVM pk:		---	.....	25	%
	Magnitude error rms:		---	.....	2	%
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-18.5	.....	+ 18.5	Hz
	RHO factor		0.9985	.....	---	---

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
13	**QCDMA REVERSE CH:**					
	EVM rms:		---	.....	6	%
	EVM pk:		---	.....	25	%
	Magnitude error rms:		---	.....	6	%
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-18.5	.....	+ 18.5	Hz
	RHO factor		0.9985	.....	---	---
Residual error - no FSK FSEB30, FSEM30 or FSEB20, FSEM20 incl. FSE-B4:						
14	**PCS1900**					
	EVM rms:		---		1.4	%
	Magnitude error rms:		---	.....	1.4	%
	Phase error rms:		---	.....	0.7	°
	Phase error pk:		---	.....	3	°
	I/Q offset:		---	.....	0.28	%
	Freq. error:		-2	.....	2	Hz
				.....		
15	**NADC (PDC, TETRA)**					
	EVM rms:		---	.....	0.7	%
	EVM pk:		---	.....	3	%
	Magnitude error rms:		---	.....	0.7	%
	I/Q offset:		---	.....	0.28	%
	Freq. error:		-0.3	.....	+ 0.3	Hz

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
16	**PHS**					
	EVM rms:		---	.....	1.4	%
	EVM pk:		---	.....	6.3	%
	Magnitude error rms:		---	.....	1.4	%
	I/Q offset:		---	.....	0.28	%
	Freq. error:		-1.4	.....	+ 1.4	Hz
17	**QCDMA FORWARD CH:**					
	EVM rms:		---	.....	2.8	%
	EVM pk:		---	.....	12.7	%
	Magnitude error rms:		---	.....	2.8	%
	I/Q offset:		---	.....	0.28	%
	Freq. error:		-8.7	.....	+ 8.7	Hz
	RHO factor		0.9993	.....	---	---
18	**QCDMA REVERSE CH:**					
	EVM rms:		---	.....	2.8	%
	EVM pk:		---	.....	12.7	%
	Magnitude error rms:		---	.....	2.8	%
	I/Q offset:		---	.....	0.28	%
	Freq. error:		-8.7	.....	+ 8.7	Hz
	RHO factor		0.9993	.....	---	---
Residual error - no FSK FSEB20, FSEM20 without FSE-B4:						
19	**PCS1900** EVM rms:		---	.....	4.2	%
	Magnitude error rms:		---	.....	4.2	%
	Phase error rms:		---	.....	2.1	°
	Phase error pk:		---	.....	8.9	°
	I/Q offset:		---	.....	0.84	%
	Freq. error:		-6.1	.....	6.1	Hz

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
20	**NADC (PDC, TETRA)**					
	EVM rms:		---	.....	2.1	%
	EVM pk:		---	.....	8.9	%
	Magnitude error rms:		---	.....	2.1	%
	I/Q offset:		---	.....	0.84	%
	Freq. error:		-0.9	.....	+ 0.9	Hz
21	**PHS**					
	EVM rms:		---	.....	4.2	%
	EVM pk:		---	.....	17.8	%
	Magnitude error rms:		---	.....	4.2	%
	I/Q offset:		---	.....	0.84	%
	Freq. error:		-4.4	.....	+ 4.4	Hz
22	**QCDMA FORWARD CH:**					
	EVM rms:		---	.....	8.4	%
	EVM pk:		---	.....	25.2	%
	Magnitude error rms:		---	.....	8.4	%
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-18.5	.....	+ 18.5	Hz
	RHO factor		0.9985	.....	---	---
23	**QCDMA REVERSE CH:**					
	EVM rms:		---	.....	8.4	%
	EVM pk:		---	.....	25.2	%
	Magnitude error rms:		---	.....	8.4	%
	I/Q offset:		---	.....	0.6	%
	Freq. error:		-18.5	.....	+ 18.5	Hz
	RHO factor		0.9985	.....	---	---

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
Residual error - FSK FSEA30, FSEA20 + FSE-B4:						
24	**ERMES:**					
	Magnitude error rms:		---	---	1	%
	FSK dev. error rms		---	.....	46.8	Hz
	FSK dev. of nom.		-46.8	.....	+46.8	Hz
	Freq. error		-23.4	.....	23.4	Hz
25	**CT2:**					
	Magnitude error rms:		---	---	1	%
	FSK dev. error rms		---	.....	180	Hz
	FSK dev. of nom.		-180	.....	+180	Hz
	Freq. error		-90	.....	+90	Hz
26	**DECT:**					
	Magnitude error rms:		---	----	2	%
	FSK dev. error rms		---	.....	5.76	kHz
	FSK dev. of nom.		-5.76	.....	+5.76	kHz
	Freq. error		-2.88	.....	+2.88	kHz
Residual error - FSK FSEA20 without FSE-B4:						
27	**ERMES:**					
	Magnitude error rms:		---	----	3	%
	FSK dev. error rms		---	.....	140	Hz
	FSK dev. of nom.		-140	.....	+140	Hz
	Freq. error		-70	.....	70	Hz
28	**CT2:**					
	Magnitude error rms:		---	----	1	%
	FSK dev. error rms		---	.....	540	Hz
	FSK dev. of nom.		-540	.....	+540	Hz
	Freq. error		-270	.....	+270	Hz

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
29	**DECT:**					
	Magnitude error rms:		---	----	2	%
	FSK dev. error rms		---	.....	5.76	kHz
	FSK dev. of nom.		-5.76	.....	+5.76	kHz
	Freq. error		-2.88	.....	+2.88	kHz
30	**Residual error - FSK** **FSEB30, FSEM30 or FSEB20, FSEM20 + FSE-B4:**					
31	**ERMES:**					
	Magnitude error rms:		----	----	1	%
	FSK dev. error rms		----	.....	46.8	Hz
	FSK dev. of nom.		-46.8	.....	+46.8	Hz
	Freq. error		-23.4	.....	23.4	Hz
32	**CT2:**					
	Magnitude error rms:		----	----	1	%
	FSK dev. error rms		----	.....	180	Hz
	FSK dev. of nom.		-180	.....	+180	Hz
	Freq. error		-90	.....	+90	Hz
33	**DECT:**					
	Magnitude error rms:		----	----	2	%
	FSK dev. error rms		----	.....	5.76	kHz
	FSK dev. of nom.		-5.76	.....	+5.76	kHz
	Freq. error		-2.88	.....	+2.88	kHz

Item	Characteristic	Measure acc. to section	Min. value	Act. value	Max. value	Unit
Residual error - FSK FSEB20, FSEM20 without FSE-B4:						
34	**ERMES:**					
	Magnitude error rms:		----	----	1	%
	FSK dev. error rms		----	.....	46.8	Hz
	FSK dev. of nom.		-46.8	.....	+46.8	Hz
	Freq. error		-23.4	.....	23.4	Hz
35	**CT2:**					
	Magnitude error rms:		---	----	1	%
	FSK dev. error rms		---	.....	180	Hz
	FSK dev. of nom.		-180	.....	+180	Hz
	Freq. error		-90	.....	+90	Hz
36	**DECT:**					
	Magnitude error rms:		----		2	%
	FSK dev. error rms		----	.....	5.76	kHz
	FSK dev. of nom.		-5.76	.....	+5.76	kHz
	Freq. error		-2.88	.....	+2.88	kHz

Annex C – Alphabetical List of Commands

Command	Parameter	Page
ABORt		3.6-7
CALCulate<1|2>:DELTamarker<1 to 4>:AOFF		3.6-9
CALCulate<1|2>:DELT<1 to 4>:FUNCtion:FIXed:RPOint:X	<numeric_value>	3.6-12
CALCulate<1|2>:DELT<1 to 4>:FUNCtion:FIXed:RPOint:Y		3.6-12
CALCulate<1|2>:DELT<1 to 4>:FUNCtion:FIXed:RPOint:Y:OFFSet	<numeric_value>	3.6-12
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TRIGger<1|2>[:SEQuence]:VIDeo:LINE:NUMBer	<numeric value>	3.6-186
TRIGger<1|2>[:SEQuence]:VIDeo:SSIGnal:POLarity	NEGative | POSitive	3.6-186
UNIT<1|2>:POWer	DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere V | W | DB | PCT | UNITLESS | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ	3.6-189
UNIT<1|2>:PROBe	ON | OFF	3.6-189

Command	Description
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]